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Naval Education and
Training Command

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November 1985
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Officer
Text

The Weapons Officer

D207.208/6:

Although the words "he," "him," and "his" are used sparingly in this manual to enhance communication, they are not intended to be gender driven nor to affront or discriminate against anyone reading *The Weapons Officer*, NAVEDTRA 10867-D.

Naval Education And Training Program Development Center

THE WEAPONS OFFICER

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NAVEDTRA 10867-D

DEPARTMENT OF THE NAVY
CHIEF OF NAVAL EDUC AND TNG

1985 Edition Prepared by
TMCM Earnest E. Hall

READEX FICHE best copy available

PREFACE

This Officer Text (OT) and its Officer-Enlisted Correspondence Course (OCC-ECC) form a self-study package that will acquaint officers and enlisted personnel with the duties and responsibilities of a weapons officer.

The information contained in this manual, however, provides only basic procedures and guidance about running a modern weapons department. With the rapid technological advancements being made in today's Navy, procedures and doctrines change frequently. It is therefore imperative that you always consult current directives and procedures for information concerning administrative or doctrinal procedures.

The Weapons Officer does not cover the technical part of your job, but it certainly gives you a "leg up" in administering your department.

Designed for individual study and not formal classroom instruction, the OT provides subject matter that relates directly to the duties and responsibilities of running a weapons department. The OCC-ECC provides the usual way of satisfying the requirements for completing the OT. The set of assignments in the OCC-ECC includes the learning objective and supporting items designed to emphasize the key points covered in the OT.

The publication was prepared by the Naval Education and Training Program Development Center, Pensacola, Florida, for the Chief of Naval Education and Training. Suggestions, comments, and criticisms are invited.

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THE UNITED STATES NAVY

GUARDIAN OF OUR COUNTRY

The United States Navy is responsible for maintaining control of the sea and is a ready force on watch at home and overseas, capable of strong action to preserve the peace or of instant offensive action to win in war.

It is upon the maintenance of this control that our country's glorious future depends; the United States Navy exists to make it so.

WE SERVE WITH HONOR

Tradition, valor, and victory are the Navy's heritage from the past. To these may be added dedication, discipline, and vigilance as the watchwords of the present and the future.

At home or on distant stations we serve with pride, confident in the respect of our country, our shipmates, and our families.

Our responsibilities sober us; our adversities strengthen us.

Service to God and Country is our special privilege. We serve with honor.

THE FUTURE OF THE NAVY

The Navy will always employ new weapons, new techniques, and greater power to protect and defend the United States on the sea, under the sea, and in the air.

Now and in the future, control of the sea gives the United States her greatest advantage for the maintenance of peace and for victory in war.

Mobility, surprise, dispersal, and offensive power are the keynotes of the new Navy. The roots of the Navy lie in a strong belief in the future, in continued dedication to our tasks, and in reflection on our heritage from the past.

Never have our opportunities and our responsibilities been greater.

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THE UNITED STATES NAVY

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CHAPTER 1

ORGANIZATIONAL RELATIONSHIPS

In this chapter, you, as a naval officer, will become familiar with the organization of the U.S. Navy and its chain of command. You will also become familiar with the various publications that establish procedures, plans, and regulations governing the day-to-day performance of your daily routine. This chapter will also help you become familiar with the weapons department divisions and the responsibilities of weapons department personnel.

INTRODUCTION

As a naval officer specializing in or just learning more about weaponry, knowing some of the history of the subject should be helpful. If you are to become an efficient and effective weapons officer, you must keep abreast of the evolving principles and materials of weaponry. Ships of the line today bear little resemblance to those of many years ago. The development of weapons today is based on the same principles as those of twenty, and even forty, years ago.

Tremendous advances have taken place in the evolution of ships and their armaments over the last two centuries. Advances have also taken place in the training of personnel to man them. The Spanish Armada relied on massive fire power from the large, slow ships of the line. This supposedly invincible force suffered defeat at the hands of Sir Francis Drake. Though outgunned, Drake used the superior speed of his ships in combination with the accurate gunnery of his crews to triumph over the massive Spanish fire power.

Years later, John Paul Jones in *Bonhomme Richard* demonstrated that his superior seamanship, rigorous discipline, and better training was an advantage during his engagement with HMS *Serapis* off Flamborough Head, England. These qualities, largely the result of intensive training, made up for "Poor Richard's" rotten hull and unusable 18-pounders. Until the Civil War, naval weaponry consisted largely of smooth-bore guns classified by the weight of their shot. Ships continued to improve in speed and maneuverability, but generally were still sail powered.

With the Civil War came three major improvements: iron plating of ships, leading the way to all metal ships; a more intensive use of steam to provide the primary source of motive power; and the introduction of rifling to naval guns. Of the rifled guns used during this period, the "Parrott" was probably the best of the large ordnance. Although these three major improvements had been invented earlier, they were not extensively used in naval warfare until this time. To illustrate this point, the first steam man-of-war, the USS *Fulton* was launched in 1814 by the U.S. Navy. The "Iron Clad" was introduced during the Crimean War. Development of the rifled cannon began in Russia about 1836.

The post Civil War period saw the continued development of both ships and weapons. Breech-loading guns and better powder and projectiles were introduced, and the "Iron Clads" continued to undergo extensive development.

With World War I came developments in naval warfare—perhaps today the most important factors the weapons officer faces—the airplane and the submarine. Surface elements—the ship and the gun—continued to be developed and improved. Ships were developed with greater strength; and guns were developed with greater accuracy and with the capability of hitting targets at a greater range. Because of aircraft above the surface of the sea and submarines below it, naval warfare had now expanded into three dimensions. Aircraft were no threat to warships during World War I, but a serious menace that had to be dealt with was the submarine.

In World War II, defense against aircraft presented perhaps the greatest challenge to the surface ship. The need for new defense measures became apparent, and rather advanced fire control systems were the result. During this period the United States Navy installed the Bofors

(40mm) gun. This Swedish-developed twin gun was capable of a sustained rate of fire of 120 rounds per minute. Another widely used weapon of this period was the 5"/38 dual-purpose gun. At that time, this was the standard gun of the fleet. Today however, submarines are perhaps a greater threat than airplanes; so new weapons have been, and are being, developed to combat this threat and the newest threat—antiship missiles.

From this brief discussion of the chronological development of ships and weapons, we can see that development will continue. We can also see that the materials of naval warfare will become more and more varied and complicated. New defense methods and countermeasures, as well as new offensive weapons, must be developed if we are to maintain control of the seas. In addition, we must be able to completely master the materials at hand. We must be capable of using them in the most efficient way, almost without second thought. This will require constant study and training.

We must emphasize that excessive reliance cannot be placed on the notion that present-day weapons are tending toward "push-button" warfare. If called upon to do combat today, we would have to use the weapons on board, not the ones under development or at the proving grounds. The effective weapons officer will achieve maximum effectiveness from every weapon on board. To do this, the Navy must first achieve maximum effort from every person on board.

As weapons officer, you will direct the activities of the officers and enlisted personnel in your charge toward this common goal—maximum use and effectiveness of installed armament. You can accomplish this by organizing and planning with emphasis on training. Personnel must know and understand their individual roles, and this knowledge must be acquired before the need for it arises. Team work is absolutely essential, as it produces results where individuals would fail. An intensive, aggressive training program will help you attain those instantaneous reactions that are so important in the heat of combat.

ORIGINS OF DEFENSE AND NAVY ORGANIZATIONS

The organization of the Department of the Navy has evolved over a period of 182 years. Major changes to the basic structure have been relatively infrequent. The changes made have reflected progress towards the present-day organizational pattern of this department.

The Navy Department was initially established by act of Congress on 30 April 1798. Departmental organization was simple and clear-cut; the Secretary of the Navy (SECNAV) exercised direct control over the shore establishment and operating forces. Since 1812, numerous modifications have been incorporated into the organizational chain of command.

In 1842, Congress created a system of bureaus to provide improved procurement, distribution of material, and technical assistance. By 1915, the position of the Chief of Naval Operations (CNO) was created to fill a need for a legally responsible professional advisor to the Secretary of the Navy.

Changes to the basic organization of the Navy were the result of expansion preceding and subsequent to World War II. Experiences gained during World War II, the Korean conflict, and the Vietnam conflict led to further refinements in the organization of the Navy. The Department of the Navy's present organization might appear to be radically different from its earliest counterpart; in fact, it is remarkably similar in concept to the original 1798 organization.

Today's Navy is large and more complex, but a common thread still exists that binds it to past history. That thread is the division between the operating forces and the shore establishment. This division was further amplified by the inception of the National Security Act of 1947. This act divided the operating forces into unified and specified naval commands, from the smallest ship or station up through the Navy's chain of command. Each command is responsible, through channels, to the Secretary of Defense, and then to the President of the United States.

In 1949 the Department of Defense was established, causing the military structure to undergo a total transformation of organizational design. With the inception of the unified command structure, a dual chain of command was required for the operating forces—one chain of command for operational control, and a different chain of command for administrative control. To help you clearly identify the changes that have occurred during the years from 1798 to the present, see figures 1-1 through 1-3.

In 1966 the Secretary of the Navy instituted an organizational refinement. This was to delegate to the Chief of Naval Operations the same breadth of authority and responsibility for material,

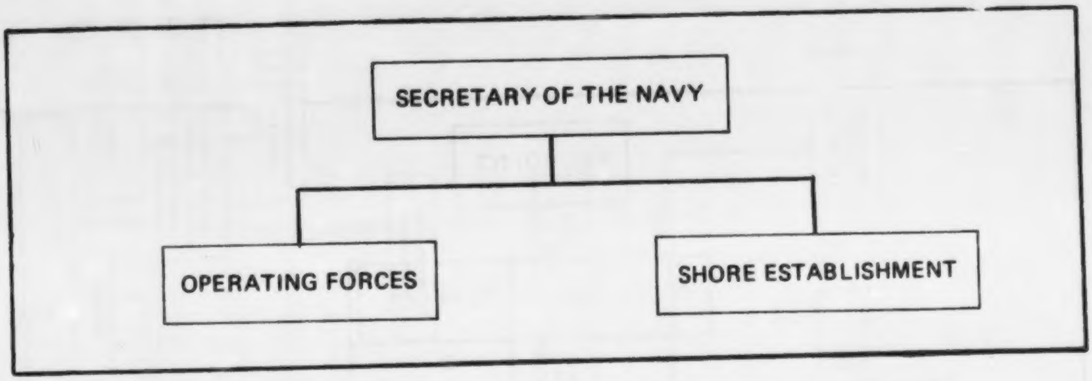

SECRETARY OF THE NAVY
OPERATING FORCES
SHORE ESTABLISHMENT

Figure 1-1.—Navy Department—1798.

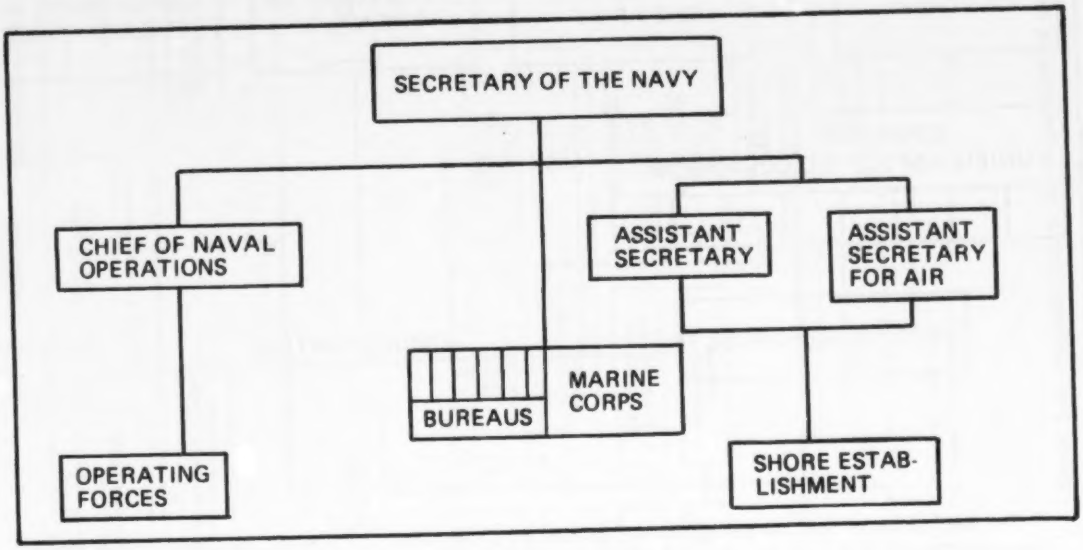

SECRETARY OF THE NAVY
CHIEF OF NAVAL OPERATIONS
ASSISTANT SECRETARY
ASSISTANT SECRETARY FOR AIR
BUREAUS
MARINE CORPS
OPERATING FORCES
SHORE ESTABLISHMENT

Figure 1-2.—Navy Department—1940.

personnel, and medical support that had been delegated to the operating forces. In figure 1-4, the present-day organization of the Department of the Navy is shown. If a more detailed organizational analysis is desired, refer to NWP 2, *Organization of the U.S. Navy*.

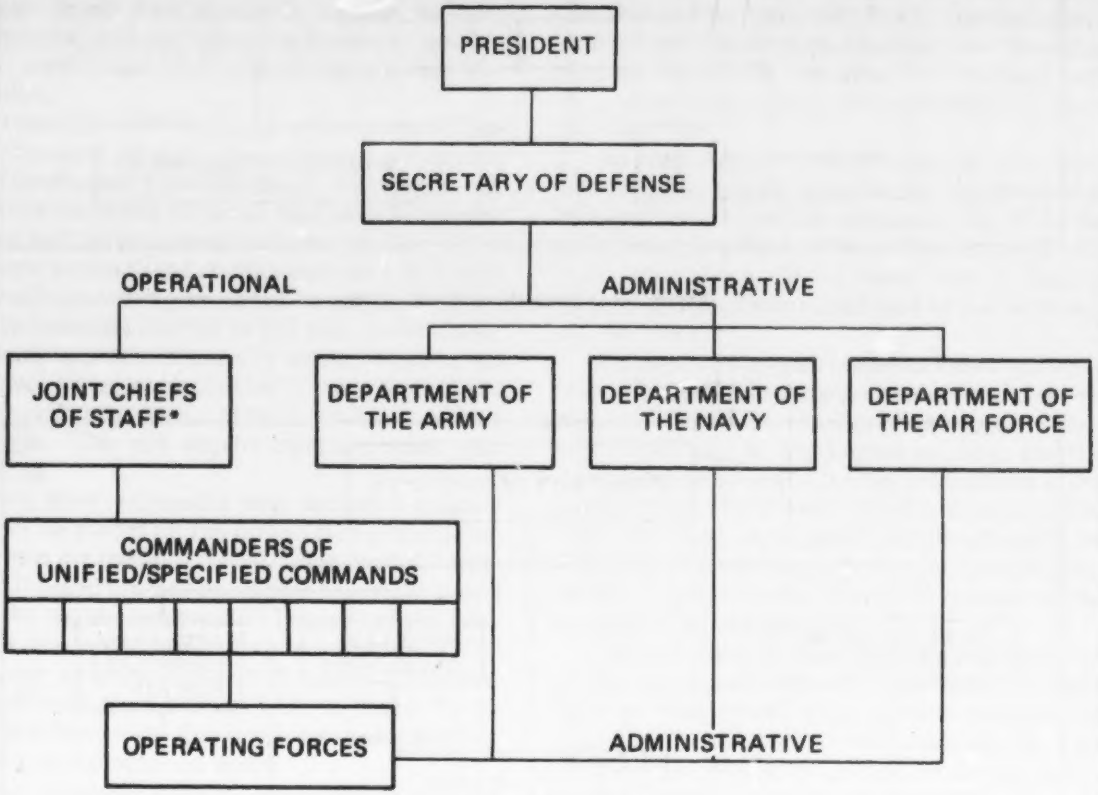
THE SUPPORTING FORCES

The United States Navy has two major functional forces: (1) the supporting forces and (2) the operating forces.

The mission of the supporting forces is to supply, maintain, and support the operating forces by furnishing materials, services, and personnel. Each command level will be discussed in the following paragraphs. For a more detailed explanation, refer to NWP 2.

The Chief of Naval Personnel (CHNAVPERS)

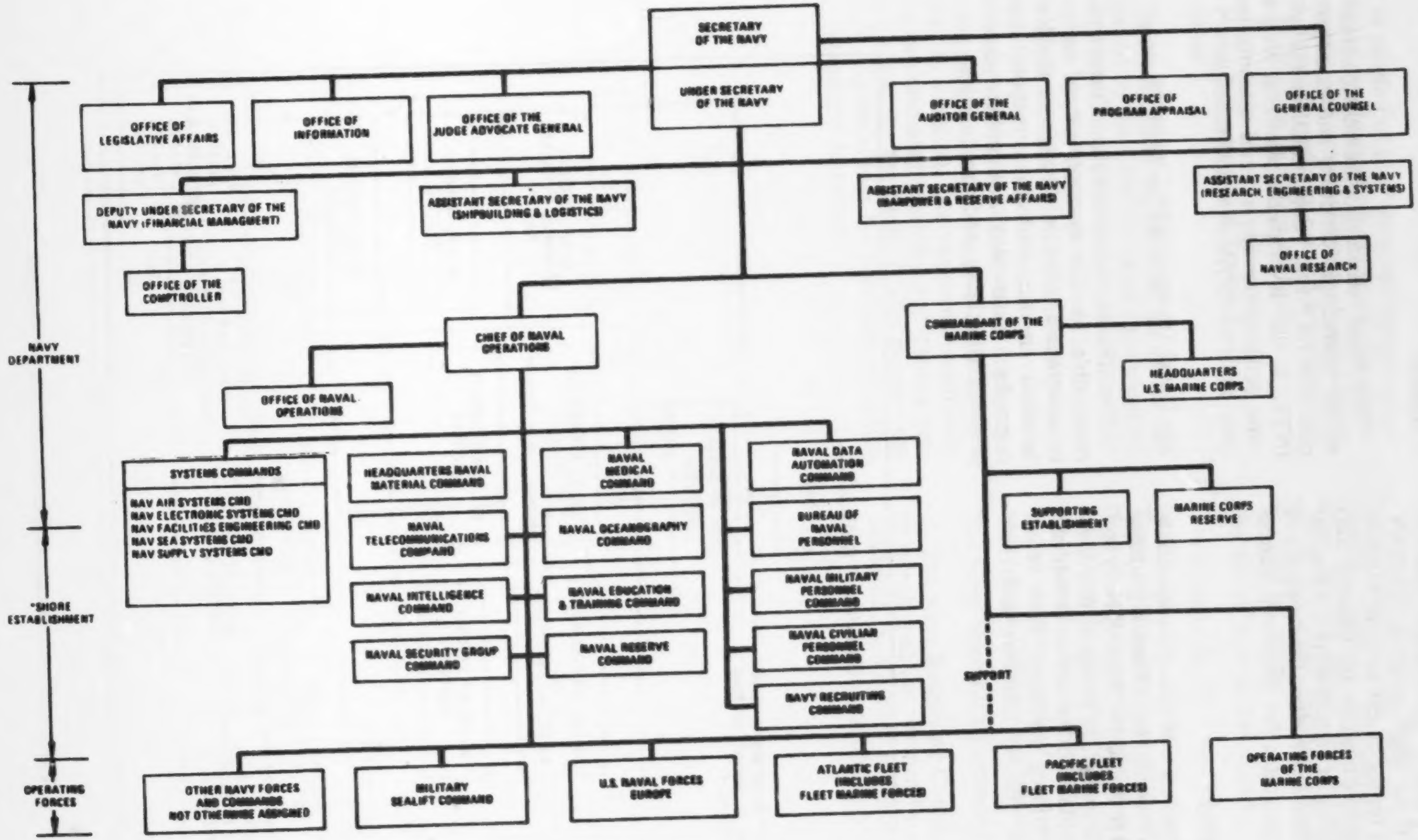
The responsibilities of the CHNAVPERS include the functions of planning and directing


PRESIDENT
SECRETARY OF DEFENSE
OPERATIONAL
ADMINISTRATIVE
JOINT CHIEFS OF STAFF*
DEPARTMENT OF THE ARMY
DEPARTMENT OF THE NAVY
DEPARTMENT OF THE AIR FORCE
COMMANDERS OF UNIFIED/SPECIFIED COMMANDS
OPERATING FORCES
ADMINISTRATIVE

* The Joint Chiefs of Staff, consisting of the Chairman; the Chief of Staff, U.S. Army; the Chief of Naval Operations; the Chief of Staff, U.S. Air Force; and the Commandant of the Marine Corps; and supported by the Organization of the Joint Chiefs of Staff are the principal military advisers to the President, the National Security Council, and the Secretary of Defense. In performance of their functions of advising the Secretary of Defense, and subject to the authority and direction of the President and the Secretary of Defense, it is the duty of the Joint Chiefs of Staff to serve as advisers and as military staff in the chain of operational command with respect to unified and specified commands, and to coordinate all communications in matters of President and Secretary of Defense to unified and specified commands, and to coordinate all communications in matters of joint interest addressed to the commanders of the unified or specified commands by other authority.

63.66

Figure 1-3.—Organizational relationship of the Department of the Navy to the Department of Defense.


SECRETARY OF THE NAVY
UNDER SECRETARY OF THE NAVY
OFFICE OF LEGISLATIVE AFFAIRS
OFFICE OF INFORMATION
OFFICE OF THE JUDGE ADVOCATE GENERAL
OFFICE OF THE AUDITOR GENERAL
OFFICE OF PROGRAM APPRAISAL
OFFICE OF THE GENERAL COUNSEL
DEPUTY UNDER SECRETARY OF THE NAVY (FINANCIAL MANAGEMENT)
ASSISTANT SECRETARY OF THE NAVY (SHIPBUILDING & LOGISTICS)
ASSISTANT SECRETARY OF THE NAVY (MANPOWER & RESERVE AFFAIRS)
ASSISTANT SECRETARY OF THE NAVY (RESEARCH, ENGINEERING & SYSTEMS)
OFFICE OF THE COMPTROLLER
OFFICE OF NAVAL RESEARCH
CHIEF OF NAVAL OPERATIONS
COMMANDANT OF THE MARINE CORPS
OFFICE OF NAVAL OPERATIONS
HEADQUARTERS U.S. MARINE CORPS
SYSTEMS COMMANDS
NAV AIR SYSTEMS CMD
NAV ELECTRONIC SYSTEMS CMD
NAV FACILITIES ENGINEERING CMD
NAV SEA SYSTEMS CMD
NAV SUPPLY SYSTEMS CMD
HEADQUARTERS NAVAL MATERIAL COMMAND
NAVAL TELECOMMUNICATIONS COMMAND
NAVAL INTELLIGENCE COMMAND
NAVAL SECURITY GROUP COMMAND
NAVAL MEDICAL COMMAND
NAVAL OCEANOGRAPHY COMMAND
NAVAL EDUCATION & TRAINING COMMAND
NAVAL RESERVE COMMAND
NAVAL DATA AUTOMATION COMMAND
BUREAU OF NAVAL PERSONNEL
NAVAL MILITARY PERSONNEL COMMAND
NAVAL CIVILIAN PERSONNEL COMMAND
NAVY RECRUITING COMMAND
SUPPORTING ESTABLISHMENT
MARINE CORPS RESERVE
SUPPORT
OTHER NAVY FORCES AND COMMANDS NOT OTHERWISE ASSIGNED
MILITARY SEALIFT COMMAND
U.S. NAVAL FORCES EUROPE
ATLANTIC FLEET (INCLUDES FLEET MARINE FORCES)
PACIFIC FLEET (INCLUDES FLEET MARINE FORCES)
OPERATING FORCES OF THE MARINE CORPS
NAVY DEPARTMENT
*SHORE ESTABLISHMENT
OPERATING FORCES

*Also Includes Other Designated Shore Activities, Not Shown On The Chart, Which Are Under The Command Or Supervision Of The Organizations Depicted

63.67

Figure 1-4.—Organization of the Department of the Navy.

for the procurement, distribution, administration, and career motivation of all naval personnel. As an adjunct to these responsibilities, CHNAVPERS also plans for the quantitative requirements of military-oriented education and training. This includes the training of personnel for the Regular Navy and the Naval Reserve and the development of Navy-wide programs for improved human relations.

The Naval Medical Command

The Naval Medical Command is responsible for providing professional and technical guidance to safeguard and promote the health of Navy and Marine Corps personnel. In addition, this command provides guidance in the care and treatment of its sick and injured personnel, both active duty and retired military members and their dependents.

The Naval Telecommunications Command

The Naval Telecommunications Command exercises operational direction and management control of the Naval Telecommunications System (NTS). It also develops the planning, programming, and implementing of naval telecommunications equipment, systems, and facilities.

The Naval Oceanography Command

The Naval Oceanography Command is responsible for the management of assigned oceanographic activities throughout the Navy. Included are the following functions: oceanography, meteorology, mapping, charting, geodesy, astronomy, and chronometry.

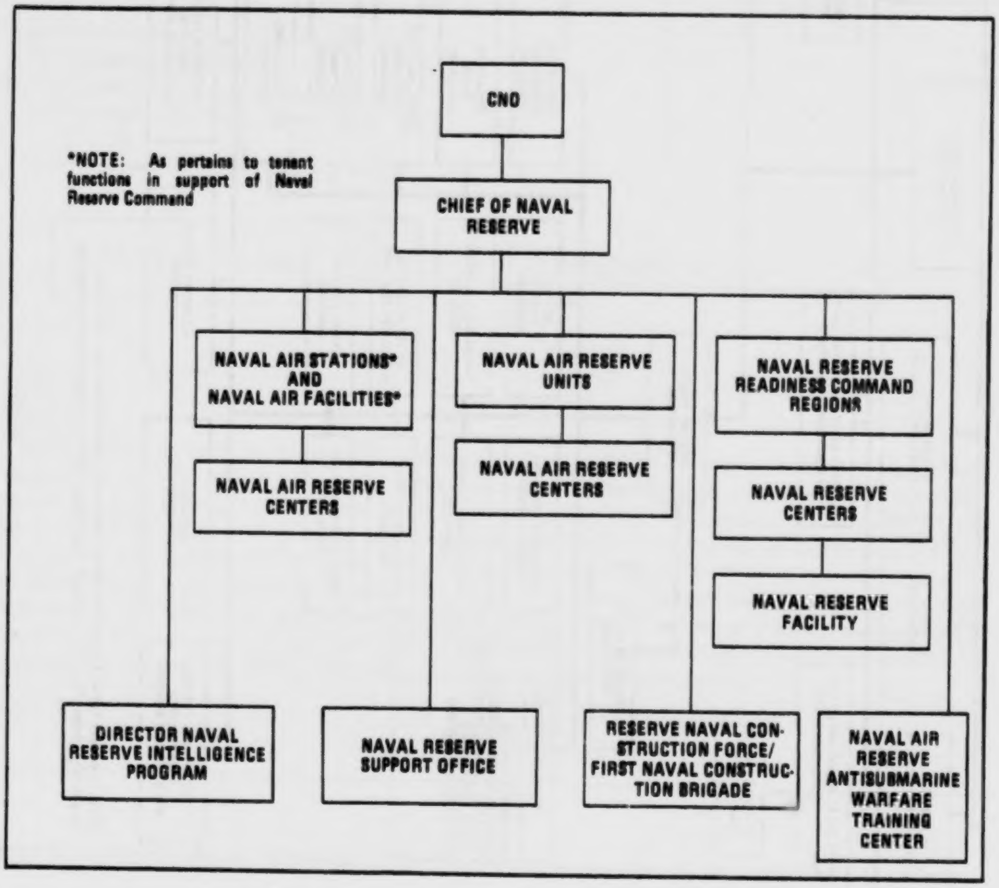

CNO
*NOTE: As pertains to tenant functions in support of Naval Reserve Command
CHIEF OF NAVAL RESERVE
NAVAL AIR STATIONS* AND NAVAL AIR FACILITIES*
NAVAL AIR RESERVE CENTERS
NAVAL AIR RESERVE UNITS
NAVAL AIR RESERVE CENTERS
NAVAL RESERVE READINESS COMMAND REGIONS
NAVAL RESERVE CENTERS
NAVAL RESERVE FACILITY
DIRECTOR NAVAL RESERVE INTELLIGENCE PROGRAM
NAVAL RESERVE SUPPORT OFFICE
RESERVE NAVAL CONSTRUCTION FORCE/ FIRST NAVAL CONSTRUCTION BRIGADE
NAVAL AIR RESERVE ANTISUBMARINE WARFARE TRAINING CENTER

Figure 1-5.—Naval Reserve organizational chain of command.

The Naval Intelligence Command

The mission of the Naval Intelligence Command is to provide and fulfill the intelligence requirements and responsibilities of the United States Navy. It performs related functions and tasks as directed by higher authority.

The Naval Education and Training Command

The Naval Education and Training Command is directed by the Chief of Naval Operations to provide shore-based education and training for Navy and Marine Corps personnel. It also provides education and training for personnel who provide support to the fleets, the naval shore establishments, the Naval Reserve, the interservice training program, and the security assistance programs. In addition, the command specifically develops designated education and training programs afloat for the fleets. It also executes the Navy's responsibilities for voluntary education and dependents education.

The Naval Security Group Command

The Naval Security Group Command performs cryptologic and related functions; it provides for, operates, and maintains an adequate naval security group. As a naval servicewide system, it provides additional primary support to its shore activities.

The Naval Reserve Command

The Naval Reserve Command has the responsibility for management of the reserve forces. These reserve forces provide assistance to the Navy in time of war or national emergency. Figure 1-5 shows the organizational chain of command for the reserve forces. For a more detailed analysis of the reserve functions/missions, refer to the appropriate OPNAVINST and NWP 2.

The Navy Recruiting Command

The Navy Recruiting Command's mission is to recruit men and women for enlisted, officer candidate, and officer status in the regular and reserve components of the Navy. Figure 1-6 shows

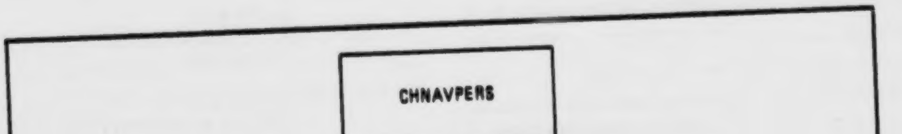
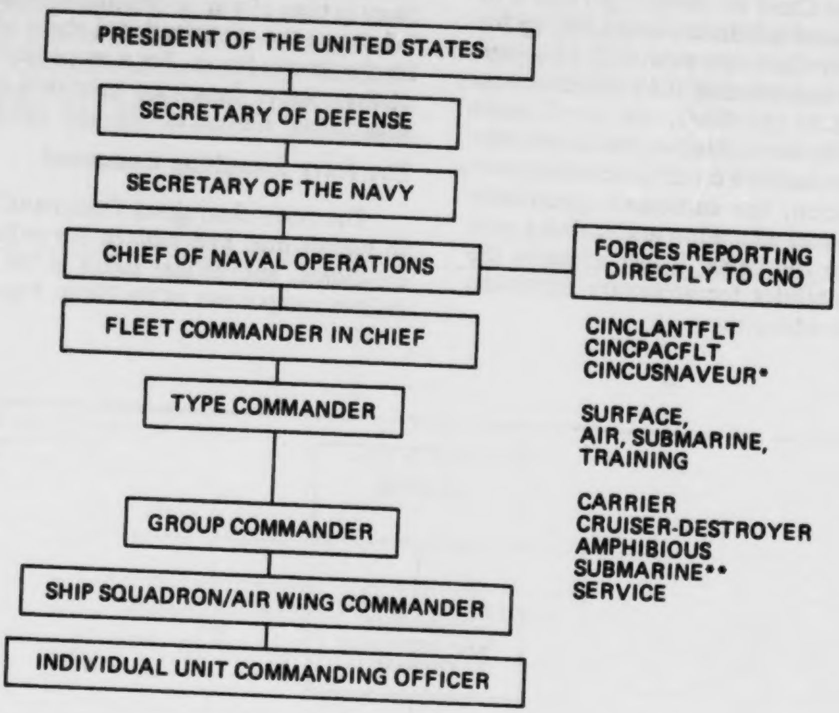

CHNAVPERS
COMMANDER NAVY RECRUITING COMMAND
NAVY RECRUITING AREA (6)
NAVY RECRUITING EXHIBIT CENTER
NAVY RECRUITING ORIENTATION UNIT
NAVY RECRUITING DISTRICT (42)

Figure 1-6.—Navy Recruiting Command chain of command.

the chain of command for the recruiting command. You will notice that the recruiting command is divided into six recruiting areas and is further subdivided into forty-two recruiting districts. You will find the individual recruiting offices of the Navy in these recruiting districts. The field recruiter is the backbone of recruiting. The recruiter is supported by the Navy recruiting exhibit center, who designs, develops, manufactures, procures, transports, and displays exhibits in support of Navy recruiting. The Navy recruiting orientation unit plans, directs, controls, and coordinates the initial recruiting orientation and subsequent field management services. The Navy recruiter receives initial training at the recruiting orientation unit. For further information on recruiting, refer to NWP 2 or the appropriate OPNAVINST.


PRESIDENT OF THE UNITED STATES
SECRETARY OF DEFENSE
SECRETARY OF THE NAVY
CHIEF OF NAVAL OPERATIONS
FORCES REPORTING DIRECTLY TO CNO
FLEET COMMANDER IN CHIEF
CINCLANTFLT
CINCPACFLT
CINCUSNAVEUR*
TYPE COMMANDER
SURFACE,
AIR, SUBMARINE,
TRAINING
GROUP COMMANDER
CARRIER
CRUISER-DESTROYER
AMPHIBIOUS
SUBMARINE**
SERVICE
SHIP SQUADRON/AIR WING COMMANDER
INDIVIDUAL UNIT COMMANDING OFFICER

Note

* CINCUSNAVEUR does not have administrative control of forward deployed CINCLANTFLT units, but does report to the CNO on administrative matters.

**Submarine group commanders do not have administrative control of submarine squadrons. The administrative chain of command for submarines passes directly from the type to the squadron commander. When submarines are administratively assigned to groups, the group commander exercises his administrative responsibilities as a squadron commander while retaining his operational responsibility as a group commander.

Figure 1-7.—Administrative chain of command of the operating forces. 63.68

THE OPERATING FORCES

The operating forces are either combat or combat support orientated. The combatant forces and certain support groups are assigned for duty under the command of either a unified or specified commander. Included as part of the Navy's operating forces are the forces of the following commands:

1. Major commands afloat that operate directly under the command of the CNO
2. The Military Sealift Command
3. The Pacific and Atlantic Fleets, consisting of the
    a. Fleet Marine Forces
    b. Naval Air Forces
    c. Naval Surface Forces
    d. Submarine Forces
    e. Training Commands
4. Those shore activities assigned to the operating forces for support

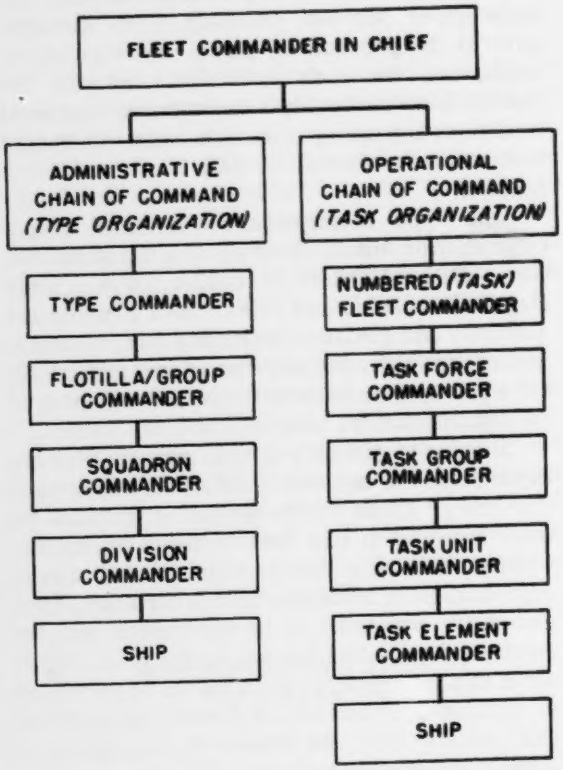
The operating forces of the Navy provide the necessary naval operations to carry out, uphold, and advance the national policies and interests of the United States.

Figure 1-7 displays the administrative organization of the operating forces. You, as a weapons officer, will be more directly concerned with your respective type commanders who maintain administrative control of your ship's functions.

No clear distinction exists between administrative and operational commands; administrative staffs have operational duties and operational staffs have administrative responsibilities. In this discussion, however, only tactical commands will be considered operational. This arbitrary dividing line between commands was established to alleviate the burden of administrative duties from tactical organizations. Tactical organizations cannot operate efficiently if they are burdened with extensive administrative duties. Because of the overlapping of functions, unit commanders within a task force may be responsible to two superiors—to the tactical commander operationally and the type commander administratively.

Fleet Organization

Fleets are composed of separate organizations—the task organization and the type organization. These organizations fulfill the operational and administrative requirements of fleet operational units. In figure 1-8 the operational chain of command is indicated in the task organization, and the administrative chain of command is indicated in the type organization. A fleet commander in chief exercises both operational and administrative control. For example, under Commander in Chief, U.S. Pacific Fleet (CINCPACFLT), are administrative type commands. Such commands include the cruiser-destroyer force, the naval air force, the amphibious force, the fleet marine force, and the training command. The operational tactical commands are those such as the First and Seventh Fleets. For operational flexibility, these numbered task fleets are divided into task forces, task groups, and lesser units. All of these units are temporarily composed from the type commands


FLEET COMMANDER IN CHIEF
ADMINISTRATIVE CHAIN OF COMMAND (TYPE ORGANIZATION)
OPERATIONAL CHAIN OF COMMAND (TASK ORGANIZATION)
TYPE COMMANDER
NUMBERED (TASK) FLEET COMMANDER
FLOTILLA/GROUP COMMANDER
TASK FORCE COMMANDER
SQUADRON COMMANDER
TASK GROUP COMMANDER
DIVISION COMMANDER
TASK UNIT COMMANDER
SHIP
TASK ELEMENT COMMANDER
SHIP

89.4

Figure 1-8.—The fleet and type chain of command.

and formed only for a specific mission or for specific missions. When a mission is completed, the organizational elements revert to a fleet commander or to their respective type commanders for further assignment.

Type Organization

Type commanders are responsible for providing personnel and supplies for basic training and for initial conditioning of the ships. When ships have been fully manned and equipped and personnel have been trained in seamanship, gunnery, and other shipboard procedures they are said to be complete. When ships are complete they are organized into units. For example, the cruiser-destroyer type command is organized into destroyer divisions, destroyer squadrons, and cruiser-destroyer flotillas.

SHIPBOARD ORGANIZATION

During your preliminary training to be a naval officer, or since that time, you have been acquainted with the *Ship's Organization and Regulations Manual (SORM)*. This directive governs the procedures, plans, and regulations established for each individual ship for the coordination of the ship's departments in general evolutions and emergencies. It is based on the type commander's *Standard Ship's Organization Manual*.

The type commander's *Standard Ship's Organization Manual* is issued as a naval instruction. OPNAVINST 3120.32A, *U.S. Navy Regulations 1973*, and NWIP 50-1 provide the authority and guidance for issuing these manuals. Sound administrative and operational procedures are a prerequisite to the effective management of an organization as large as the U.S. Navy.

Standard operating procedures (SOPs) are implemented to assist in fulfilling the missions of the Navy. These SOPs permit a ship to be transferred from one fleet or force to another without the ship being required to rewrite organization or administrative procedures. They also allow personnel to be transferred without extensive new indoctrination to like ships. SOPs serve as a reference for the training of personnel in shipboard procedures. A commanding officer can deviate from the standard procedures to achieve more efficiency and effectiveness. Circumstances for change from the standard procedures can be caused by either the ship's design, its manning levels, or changing operational conditions. However, commanding officers are held strictly accountable for these changes to standard procedures. Should changes to the standard procedures be made, commanding officers must still meet the administrative and operational requirements of the type standard organization. The general organization of a naval ship is inclusively outlined in OPNAVINST 3120.32; it is brought up to the working level by the specific *Ship's Organization and Regulations Manual (SORM)*.

Of equal importance to your ship is the *Battle Organization Manual* discussed later.

DEPARTMENTAL ORGANIZATION

Except as specified in the following pages, each ship is organized into five departments as follows:

1. An operations department.
2. A navigation department.
3. A weapons department or a combat systems department. The offensive characteristics of some ships are not primarily related to ordnance or aircraft carriers that have both a weapons and a deck department. Some ships are specifically authorized to have a combat systems department instead of a weapons department. As the organization dictates, in certain classes of submarines, the weapons department may be called the combat systems department.
4. An engineering department.
5. A supply department.

In surface combatants with complex, integrated combat systems, and as authorized by the Chief of Naval Operations, a combat systems department shall be established in lieu of a weapons department. When embarked, ships assigned a helicopter detachment for an extended period (that is, LAMPS, VERTREP) also have an aviation department.

A ship can be considered to be somewhat like a living organism. Certain functions are detailed to be carried out by specific units within the organism. Many of these functions can overlap if any one of the specific units should fail to perform its assigned function. Some units cannot perform their assigned functions without another unit first performing its function. For example, the weapons department is unable to perform a call fire mission during a shore bombardment mission without the immediate participation of both the navigation and the operations department. All units within the organization must maintain close coordination. Failure of any one of the units to perform its function will greatly reduce the capability of the organization to carry out its mission. Further consideration of this cooperation between units is given later in the section on battle organization.

Departmental organization describes not only the operational functions of specific departments but also the administrative functioning of those departments. In the administrative sense, it shows, among other things, the areas in which the various enlisted ratings assigned to the ship are placed when they come aboard. The standard organization acts like a computer program. It organizes and directs the actions of the individuals assigned to each department throughout the ship. Figure 1-9 shows a representative shipboard organization structure. Departments shown in the boxes are not common to all ship types. Figure 1-10 shows a representative shipboard combat systems organization.

You should remember that the combatant ship's primary mission is to fight. Everything that is done on a ship is directed toward making the ship the best fighting machine possible. The ship is also the home of the personnel assigned to it. The ship is used more as a home than as a fighting machine. That is why the everyday routine assignments on board a combatant ship are regimented. Such a regimented routine allows the changeover from a peaceful cruising situation to a battle situation to take place in a relatively short time. A clean and well-maintained ship is not only a pleasant place to live, but a safer place to be when controlling battle damage.

BATTLE ORGANIZATION

An adjunct to the *Ship's Organization and Regulations Manual* is the *Ship's Battle Organization Manual*. A separate manual is prepared by the type commander for each ship or class in the command. NWIP 50-1(D), *Battle Control* (C), prepared by CNO, is used to prepare the manual for each ship. NWIP 50-1(D) lays the groundwork for the most efficient use of personnel in various battle situations. It is limited, however, to standardization of policy and procedures to be used in the various battle situations faced by the particular type and class of ship.

The *Battle Organization Manual* specifies how the different units of the battle organization of a ship relate to each other. In studying it, you can see at a glance that close coordination of all battle stations is necessary in obtaining a smoothly functioning battle organization. Your particular ship's battle organization is based on the example provided by the type commander; but, as with the *Ship's Organization and Regulations Manual*, it probably deviates from the example to include the peculiarities of your particular ship. The commanding officer is authorized to change from the provided example order to best use the personnel assigned to the command.

The *Battle Organization Manual* usually contains four chapters. One or more appendices may be included for the combined complement and allowance of personnel. NWIP 50-1(D) contains a complete description of the basic contents in addition to the type commander's required organization. Part of your administrative duties as a weapons officer will be to review or compile a watch, quarter, and station (WQS) bill. One section of the *Battle Organization Manual* is a listing by billet number of enlisted assignments in your division. Remember that the WQS bill must be accurately kept up to date since it is considered the "bible" for guiding your enlisted personnel.

The four chapters of the *Battle Organization Manual* are as follows:

Chapter 1, "Battle Organization"—Includes basic information as to the components of the specific organization.

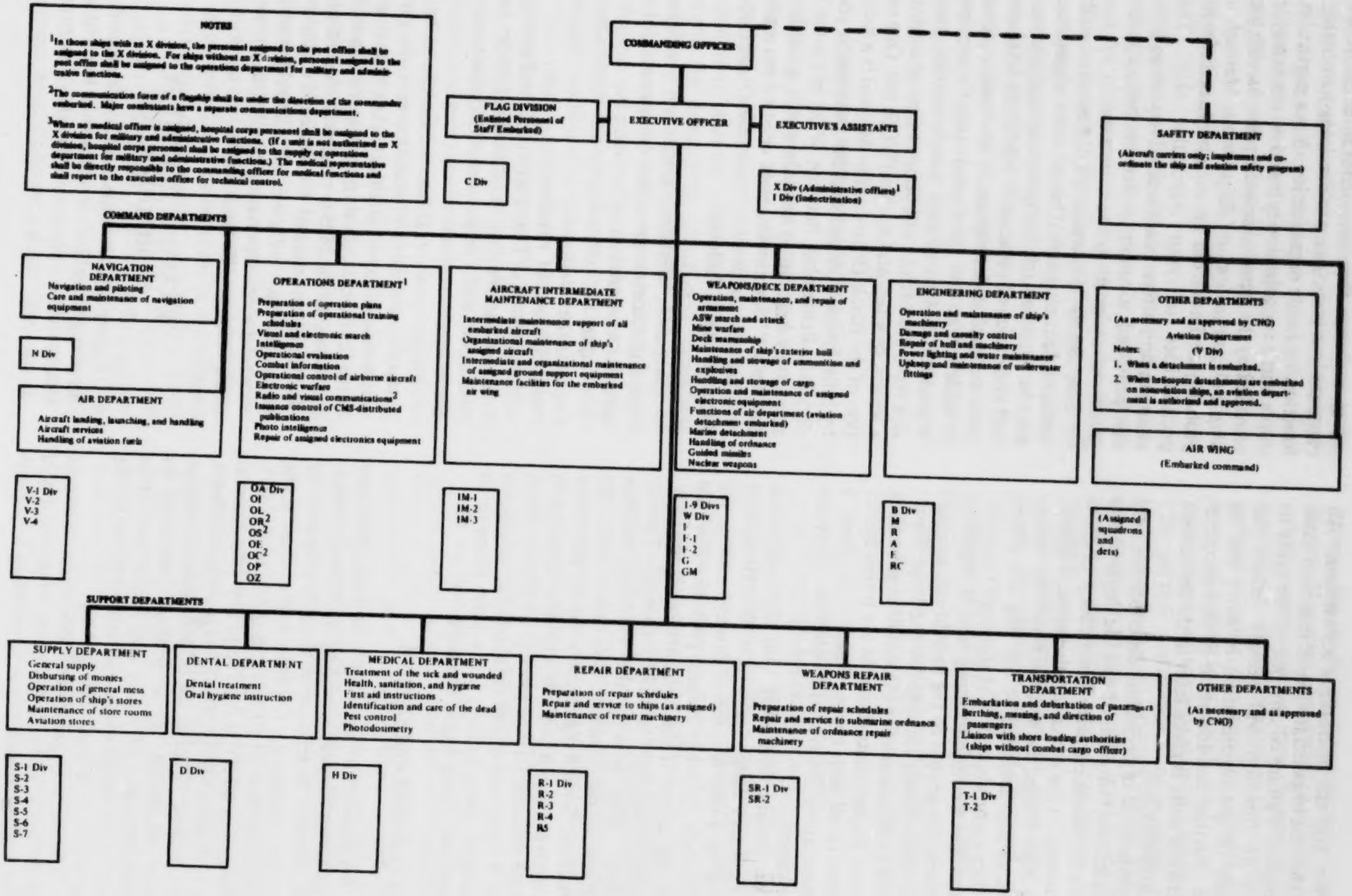
Chapter 2, "Conditions of Readiness"—Explains the relationship of condition watches to the conditions of readiness.

Chapter 3, "The Battle Bill"—Provides a listing of the stations to be manned under battle conditions and the personnel requirements for manning the stations.

Chapter 4, "Interior Communication System"—Provides information as to the various communications available within the ship for battle control. All ship types will have their individual battle bills arranged along these lines. To better understand the concept of the battle organization, see figure 1-11. Should you desire more detailed information on the battle organization, refer to NWIP 50-1(D).

WEAPONS DEPARTMENT ORGANIZATION

Figure 1-12 illustrates a CV weapons department organization. In ships that have offensive characteristics not primarily related to ordnance or aircraft, deck responsibilities overshadow


COMMANDING OFFICER
FLAG DIVISION
(Enlisted Personnel of Staff Embarked)
C Div
EXECUTIVE OFFICER
EXECUTIVE'S ASSISTANTS
X Div (Administrative offices)1
I Div (Indoctrination)
SAFETY DEPARTMENT
(Aircraft carriers only; implement and coordinate the ship and aviation safety program)
COMMAND DEPARTMENTS
NAVIGATION DEPARTMENT
Navigation and piloting
Care and maintenance of navigation equipment
N Div
AIR DEPARTMENT
Aircraft landing, launching, and handling
Aircraft services
Handling of aviation fuels
V-1 Div
V-2
V-3
V-4
OPERATIONS DEPARTMENT1
Preparation of operation plans
Preparation of operational training schedules
Visual and electronic search
Intelligence
Operational evaluation
Combat information
Operational control of airborne aircraft
Electronic warfare
Radio and visual communications2
Issuance control of CMS-distributed publications
Photo intelligence
Repair of assigned electronics equipment
OA Div
OI
OL
OR2
OS2
OE
OC2
OP
OZ
AIRCRAFT INTERMEDIATE MAINTENANCE DEPARTMENT
Intermediate maintenance support of all embarked aircraft
Organizational maintenance of ship's assigned aircraft
Intermediate and organizational maintenance of assigned ground support equipment
Maintenance facilities for the embarked air wing
IM-1
IM-2
IM-3
WEAPONS/DECK DEPARTMENT
Operation, maintenance, and repair of armament
ASW search and attack
Mine warfare
Deck seamanship
Maintenance of ship's exterior hull
Handling and stowage of ammunition and explosives
Handling and stowage of cargo
Operation and maintenance of assigned electronic equipment
Functions of air department (aviation detachment embarked)
Marine detachment
Handling of ordnance
Guided missiles
Nuclear weapons
1-9 Divs
W Div
I
F-1
F-2
G
GM
ENGINEERING DEPARTMENT
Operation and maintenance of ship's machinery
Damage and casualty control
Repair of hull and machinery
Power lighting and water maintenance
Upkeep and maintenance of underwater fittings
B Div
M
R
A
E
RC
OTHER DEPARTMENTS
(As necessary and as approved by CNO)
Aviation Department
(V Div)
Notes:
1. When a detachment is embarked.
2. When helicopter detachments are embarked on nonaviation ships, an aviation department is authorized and approved.
AIR WING
(Embarked command)
(Assigned squadrons and dets)
SUPPORT DEPARTMENTS
SUPPLY DEPARTMENT
General supply
Disbursing of monies
Operation of general mess
Operation of ship's stores
Maintenance of store rooms
Aviation stores
S-1 Div
S-2
S-3
S-4
S-5
S-6
S-7
DENTAL DEPARTMENT
Dental treatment
Oral hygiene instruction
D Div
MEDICAL DEPARTMENT
Treatment of the sick and wounded
Health, sanitation, and hygiene
First aid instructions
Identification and care of the dead
Pest control
Photodosimetry
H Div
REPAIR DEPARTMENT
Preparation of repair schedules
Repair and service to ships (as assigned)
Maintenance of repair machinery
R-1 Div
R-2
R-3
R-4
R5
WEAPONS REPAIR DEPARTMENT
Preparation of repair schedules
Repair and service to submarine ordnance
Maintenance of ordnance repair machinery
SR-1 Div
SR-2
TRANSPORTATION DEPARTMENT
Embarkation and debarkation of passengers
Berthing, messing, and direction of passengers
Liaison with shore loading authorities (ships without combat cargo officer)
T-1 Div
T-2
OTHER DEPARTMENTS
(As necessary and as approved by CNO)

NOTES

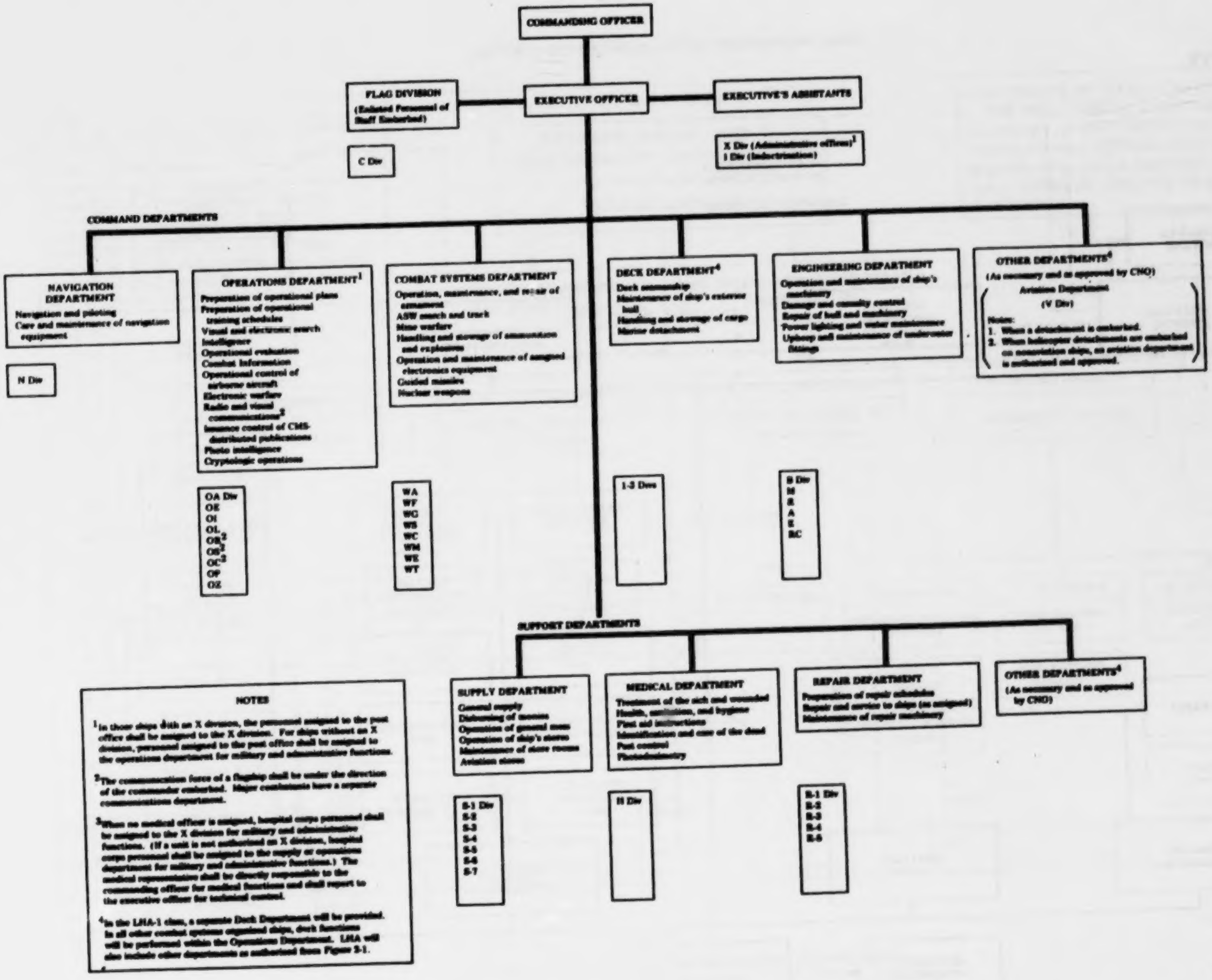
[1] In those ships with an X division, the personnel assigned to the post office shall be assigned to the X division. For ships without an X division, personnel assigned to the post office shall be assigned to the operations department for military and administrative functions.

[2] The communication force of a flagship shall be under the direction of the commander embarked. Major combatants have a separate communications department.

[3] When no medical officer is assigned, hospital corps personnel shall be assigned to the X division for military and administrative functions. (If a unit is not authorized an X division, hospital corps personnel shall be assigned to the supply or operations department for military and administrative functions.) The medical representative shall be directly responsible to the commanding officer for medical functions and shall report to the executive officer for technical control.

63.69

Figure 1-9.—Shipboard organization.


COMMANDING OFFICER
FLAG DIVISION
(Enlisted Personnel of Staff Embarked)
C Div
EXECUTIVE OFFICER
EXECUTIVE'S ASSISTANTS
X Div (Administrative offices)¹
I Div (Indoctrination)
COMMAND DEPARTMENTS
NAVIGATION DEPARTMENT
Navigation and piloting
Care and maintenance of navigation equipment
N Div
OPERATIONS DEPARTMENT¹
Preparation of operational plans
Preparation of operational training schedules
Visual and electronic search
Intelligence
Operational evaluation
Combat Information
Operational control of airborne aircraft
Electronic warfare
Radio and visual communications²
Issuance control of CMS-distributed publications
Photo intelligence
Cryptologic operations
OA Div
OE
OI
OL
OR²
OS²
OC²
OP
OZ
COMBAT SYSTEMS DEPARTMENT
Operation, maintenance, and repair of armament
ASW search and track
Mine warfare
Handling and stowage of ammunition and explosives
Operation and maintenance of assigned electronics equipment
Guided missiles
Nuclear weapons
WA
WF
WG
WS
WC
WM
WE
WT
DECK DEPARTMENT⁴
Deck seamanship
Maintenance of ship's exterior hull
Handling and stowage of cargo
Marine detachment
1-3 Divs
ENGINEERING DEPARTMENT
Operation and maintenance of ship's machinery
Damage and casualty control
Repair of hull and machinery
Power lighting and water maintenance
Upkeep and maintenance of underwater fittings
B Div
M
R
A
E
RC
OTHER DEPARTMENTS⁴
(As necessary and as approved by CNO)
Aviation Department
(V Div)
Notes:
1. When a detachment is embarked.
2. When helicopter detachments are embarked on amphibious ships, an aviation department is authorized and approved.
SUPPORT DEPARTMENTS
SUPPLY DEPARTMENT
General supply
Disbursing of monies
Operation of general mess
Operation of ship's stores
Maintenance of store rooms
Aviation stores
S-1 Div
S-2
S-3
S-4
S-5
S-6
S-7
MEDICAL DEPARTMENT
Treatment of the sick and wounded
Health, sanitation, and hygiene
First aid instructions
Identification and care of the dead
Pest control
Photodosimetry
H Div
REPAIR DEPARTMENT
Preparation of repair schedules
Repair and service to ships (as assigned)
Maintenance of repair machinery
R-1 Div
R-2
R-3
R-4
R-6
OTHER DEPARTMENTS⁴
(As necessary and as approved by CNO)

NOTES

[1] In those ships with an X division, the personnel assigned to the post office shall be assigned to the X division. For ships without an X division, personnel assigned to the post office shall be assigned to the operations department for military and administrative functions.

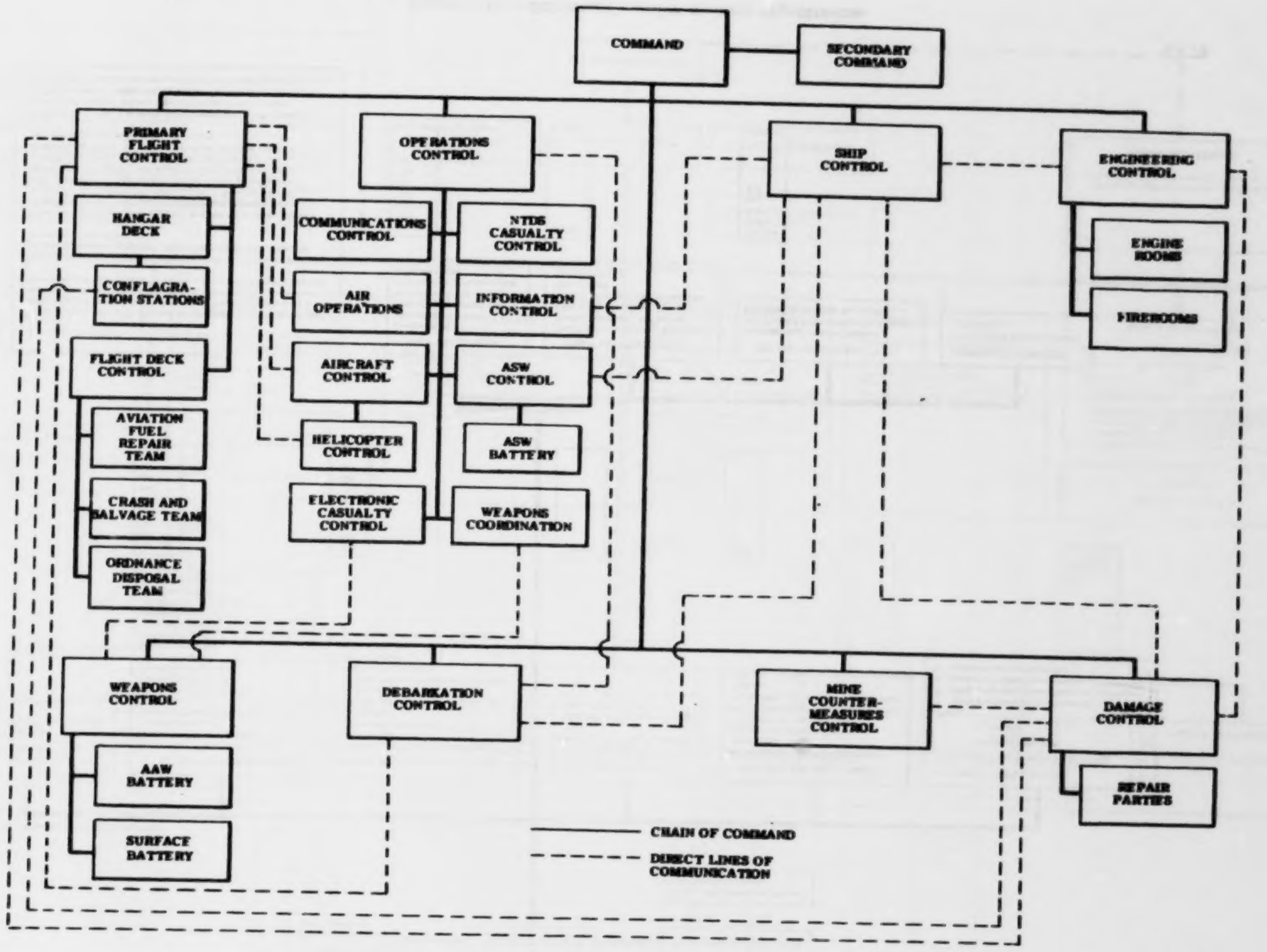
[2] The communication force of a flagship shall be under the direction of the commander embarked. Major combatants have a separate communications department.

[3] When no medical officer is assigned, hospital corps personnel shall be assigned to the X division for military and administrative functions. (If a unit is not authorized an X division, hospital corps personnel shall be assigned to the supply or operations department for military and administrative functions.) The medical representative shall be directly responsible to the commanding officer for medical functions and shall report to the executive officer for technical control.

[4] In the LHA-1 class, a separate Deck Department will be provided. In all other combat systems organized ships, deck functions will be performed within the Operations Department. LHA will also include other departments as authorized from Figure 3-1.

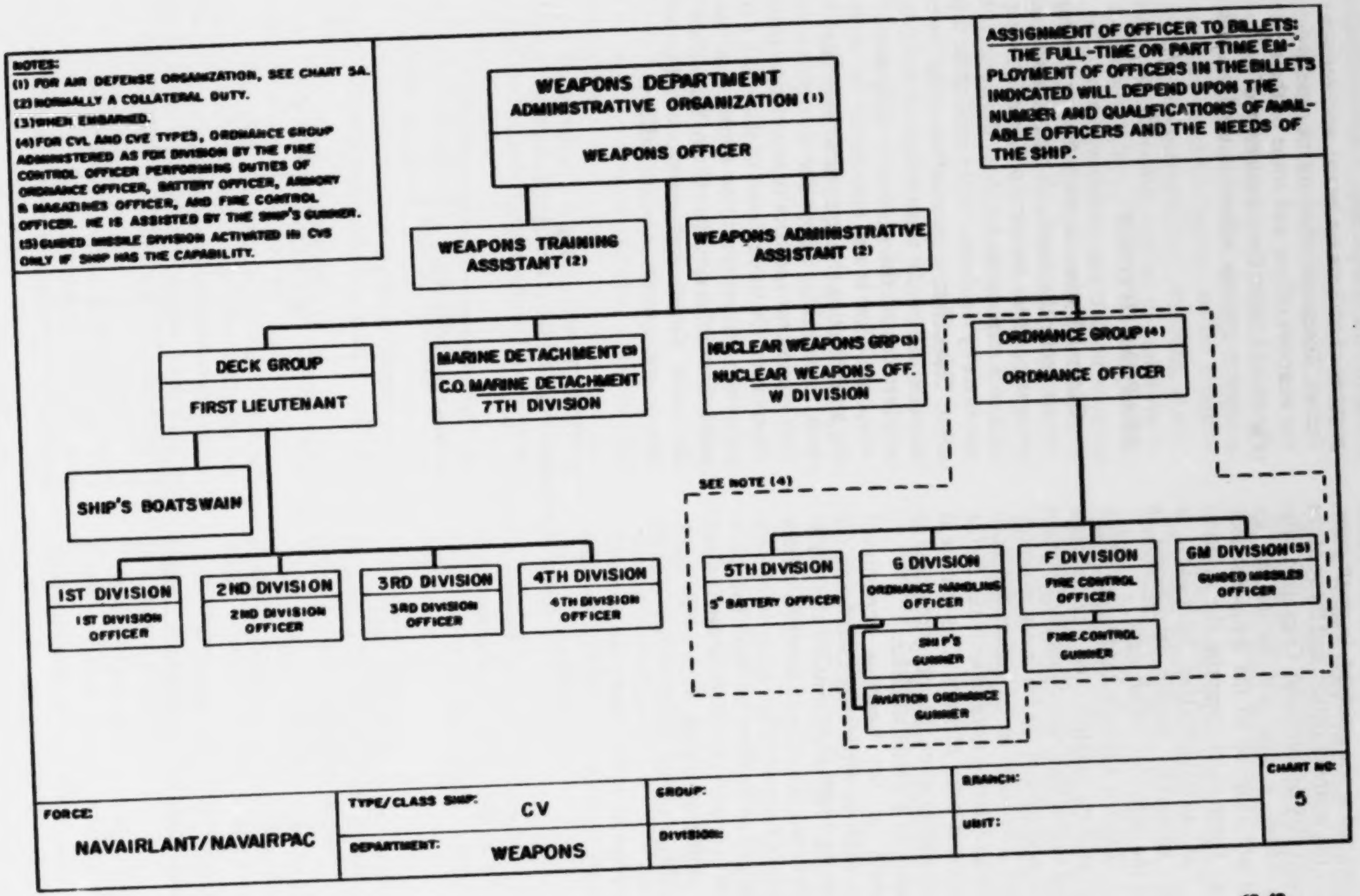
63.70

Figure 1-10.—Shipboard combat systems organization.


COMMAND
SECONDARY COMMAND
PRIMARY FLIGHT CONTROL
HANGAR DECK
CONFLAGRATION STATIONS
FLIGHT DECK CONTROL
AVIATION FUEL REPAIR TEAM
CRASH AND SALVAGE TEAM
ORDNANCE DISPOSAL TEAM
OPERATIONS CONTROL
COMMUNICATIONS CONTROL
NTDS CASUALTY CONTROL
AIR OPERATIONS
INFORMATION CONTROL
AIRCRAFT CONTROL
ASW CONTROL
HELICOPTER CONTROL
ASW BATTERY
ELECTRONIC CASUALTY CONTROL
WEAPONS COORDINATION
SHIP CONTROL
ENGINEERING CONTROL
ENGINE ROOMS
FIREROOMS
WEAPONS CONTROL
AAW BATTERY
SURFACE BATTERY
DEBARKATION CONTROL
MINE COUNTERMEASURES CONTROL
DAMAGE CONTROL
REPAIR PARTIES
CHAIN OF COMMAND
DIRECT LINES OF COMMUNICATION

63.71

Figure 1-11.—Typical battle organization chart.


WEAPONS DEPARTMENT
ADMINISTRATIVE ORGANIZATION (1)
WEAPONS OFFICER
WEAPONS TRAINING ASSISTANT (2)
WEAPONS ADMINISTRATIVE ASSISTANT (2)
DECK GROUP
FIRST LIEUTENANT
MARINE DETACHMENT (3)
C.O. MARINE DETACHMENT
7TH DIVISION
NUCLEAR WEAPONS GRP (3)
NUCLEAR WEAPONS OFF.
W DIVISION
ORDNANCE GROUP (4)
ORDNANCE OFFICER
SHIP'S BOATSWAIN
1ST DIVISION
1ST DIVISION OFFICER
2ND DIVISION
2ND DIVISION OFFICER
3RD DIVISION
3RD DIVISION OFFICER
4TH DIVISION
4TH DIVISION OFFICER
SEE NOTE (4)
5TH DIVISION
5" BATTERY OFFICER
G DIVISION
ORDNANCE HANDLING OFFICER
SHIP'S GUNNER
AVIATION ORDNANCE GUNNER
F DIVISION
FIRE CONTROL OFFICER
FIRE CONTROL GUNNER
GM DIVISION (5)
GUIDED MISSILES OFFICER
FORCE:
NAVAIRLANT/NAVAIRPAC
TYPE/CLASS SHIP:
CV
DEPARTMENT:
WEAPONS
GROUP:
DIVISION:
BRANCH:
UNIT:
CHART NO:
5

NOTES:
(1) FOR AIR DEFENSE ORGANIZATION, SEE CHART 5A.
(2) NORMALLY A COLLATERAL DUTY.
(3) WHEN EMBARKED.
(4) FOR CVL AND CVE TYPES, ORDNANCE GROUP ADMINISTERED AS FOX DIVISION BY THE FIRE CONTROL OFFICER PERFORMING DUTIES OF ORDNANCE OFFICER, BATTERY OFFICER, ARMORY & MAGAZINES OFFICER, AND FIRE CONTROL OFFICER. HE IS ASSISTED BY THE SHIP'S GUNNER.
(5) GUIDED MISSILE DIVISION ACTIVATED IN CVS ONLY IF SHIP HAS THE CAPABILITY.

ASSIGNMENT OF OFFICER TO BILLETS:
THE FULL-TIME OR PART TIME EMPLOYMENT OF OFFICERS IN THE BILLETS INDICATED WILL DEPEND UPON THE NUMBER AND QUALIFICATIONS OF AVAILABLE OFFICERS AND THE NEEDS OF THE SHIP.

63.48

Figure 1-12.—CV weapons department organization.

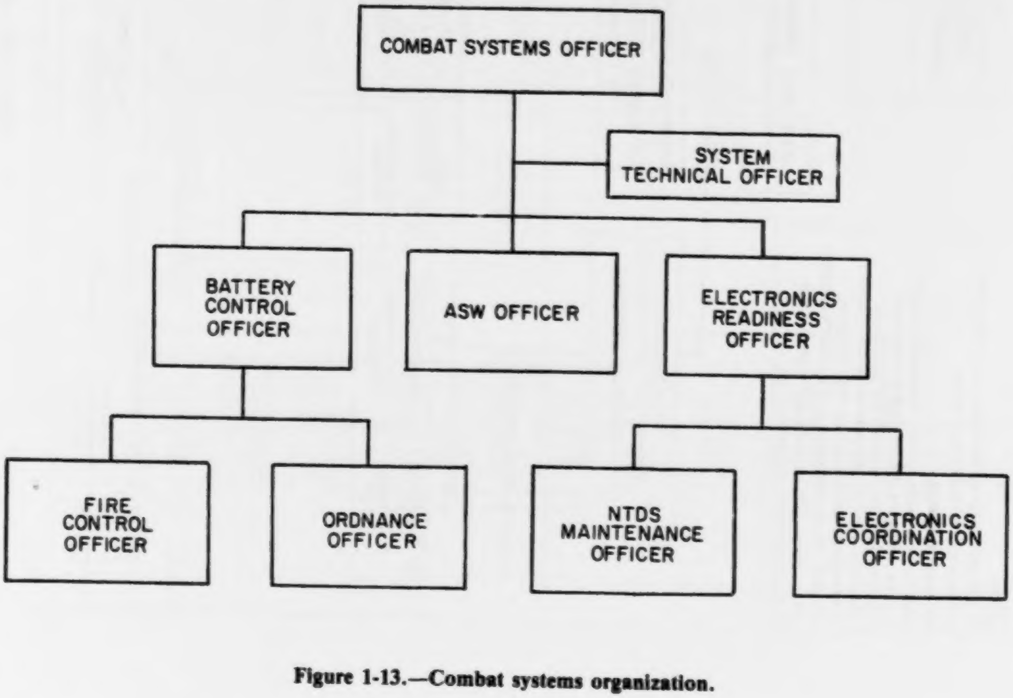
weapons. In such cases, the first lieutenant is assigned as the department head, and the weapons officer is assigned as the assistant. In small ships, the duties of the weapons officer and those of the first lieutenant may be combined. Organized aviation units within a ship not having an air department are assigned to the weapons/deck department. These units comprise the aviation division. For administrative purposes, a permanently embarked marine detachment is assigned to the weapons department.

Figure 1-12 shows a significant feature of the weapons department organization. The divisions are organized so that they may be assigned as units within the components of the battle organization. This permits personnel to be supervised both during battle and during normal activities by the same officers and petty officers. This feature is a definite advantage when the ship is required to change quickly to a battle situation.

The details of the weapons department organization must be separately established for each type of ship. Although considerable variation exists from one ship type to another, certain general aspects of organization apply to all ship types. A designated department head (weapons officer or first lieutenant) is always designated and is assigned certain assistants, such as an ASW officer, a missile officer, and a fire control officer. The number and titles of the assistants vary with the type of ship, weapons installation, number of officers on board, and various other factors. Discussed below are the general duties of the weapons officer and some of the assistants. Figure 1-13 shows the organization of a ship when a combat systems officer is used instead of a weapons officer.

WEAPONS OFFICER

General Duties. In units having a weapons department, the head of that department is designated as the weapons officer. The weapons officer is responsible for those duties prescribed elsewhere by regulation for the head of the department. This officer is responsible, under the commanding officer, for supervising and directing the employment of the ordnance equipment. The weapons officer is also responsible for supervising and directing the equipment associated with deck seamanship, except for that ordnance or deck equipment specifically assigned to another department. On those classes of ships with a combat systems department, the department head is called the combat systems officer. This officer has the same duties and responsibilities, where approximate, as the weapons officer.



63.72

Figure 1-13.—Combat systems organization.

Specific Duties. The weapons officer is responsible for the proper performance of the functions of the weapons department. These functions include the following duties:

1. The operation, care, maintenance, and inspection of the armament, armament appurtenances, and magazine spaces
2. The procurement, care, handling, testing, stowage, accountability, and use of explosives, including ammunition, ammunition components, propellants, pyrotechnics, and nuclear weapons
3. The operation, maintenance, and repair of electronic equipment in the department
4. The operation, maintenance, and repair of ASW weapons control systems and associated sonar systems
5. The operation and maintenance of the equipment connected with mine warfare, except that assigned to other departments

In ensuring these duties are performed, the weapons officer is directly responsible for the following:

1. Supervising and directing the operation, care, and maintenance of the unit's armament and fire control equipment, including guns, gun directors, missile batteries, fire control systems, ASW weapons control systems, and associated sonar systems
2. Supervising the procurement, handling, stowage, accountability, and issuing of ship and aircraft ammunition (including nuclear weapons) and pyrotechnics
3. Conducting periodic inspections of the magazines and testing of the sprinkler systems as per current directives
4. Maintaining the physical security and integrity of magazines and ready-service storage spaces
5. Ensuring that the external security of the unit is maintained
6. Directing, through the first lieutenant, the planning and executing of deck seamanship operations and evolutions, including anchoring, mooring, fueling, replenishment at sea, operating of the ship's boats, and the care and maintenance of associated equipment
7. Directing the operations of the paint, sail, and boatswain's lockers, and the stowage, care, accountability, and issuance of associated materials and equipment
8. Directing, through the first lieutenant, the maintenance, inspection, stowage, and accountability of life rafts, emergency lifeboats, life jackets, and other survival equipment
9. Supervising, through coordinating and directing, the maintenance and painting of the ship's exterior, except for those areas specifically assigned to other departments

Safety Precautions. The weapons officer ensures that applicable safety orders are posted in conspicuous and accessible places. These orders should be posted in each part of the ship where ammunition is stowed or handled or where weapons appliances are operated. In addition, all personnel concerned should be frequently and thoroughly instructed and drilled in appropriate safety precautions.

COMBAT SYSTEMS OFFICER

As a combat systems officer, you will be assigned other duties by the commanding officer as follows:

General Duties. In units having a combat systems department, the head of that department is designated the combat systems officer. This officer is responsible for those duties prescribed elsewhere by regulation for the department head. The combat systems officer supervises and directs the use of the unit's combat system, including the ordnance equipment.

Specific Duties. The combat systems officer is responsible for the proper performance of the functions of the department to include the following duties:

1. The operation, care, maintenance, and inspection of the armament, armament appurtenances, and magazine spaces

2. The procurement, care, handling, testing, stowage, accountability, and use of explosives, propellants, pyrotechnics, and nuclear weapons

3. The maintenance and repair of all electronic equipment of the unit except as assigned to another department

4. The operation, maintenance, and repair of ASW weapons control systems and associated sonar systems

5. The operation and maintenance of the equipment connected with mine warfare, except that assigned to another department

In ensuring these duties are performed, the combat systems officer is directly responsible for the following duties:

1. Supervising and directing the care and maintenance of the unit's combat system, including armament, search and detection equipment, command and control equipment, and fire control equipment
2. Supervising and directing the operation of the unit's armament and fire control equipment, including guns, gun directors, missile batteries, fire control systems, ASW weapons control systems, and associated sonar systems
3. Supervising the procurement, handling, stowage, accountability, and issuance of ship and aircraft ammunition (including nuclear weapons) and pyrotechnics
4. Conducting periodic inspections of magazines and testing of sprinkler systems as per current directives
5. Maintaining the physical security and integrity of magazines and ready-service stowage spaces
6. Ensuring that the external security of the units is maintained

Safety Precautions. The combat systems officer is responsible for all safety orders being posted in conspicuous and accessible places. These orders should be posted where ammunition or weapons appliances are operated. This officer is also responsible for ensuring that personnel are given frequent and thorough instructions/drills on these safety orders.

THE FIRST LIEUTENANT

The first lieutenant on a combatant ship is an assistant to the weapons officer. The assistant is responsible for the performance of those duties and the exercise of authority as detailed in OPNAVINST 3120.32A. This officer supervises and directs the deck force in performance of seamanship functions and evolutions; gives direct commands; and delegates responsibility for immediate supervision to the ship's boatswains or petty officers, during various evolutions, such as mooring, docking, anchoring, fueling, or transferring personnel and cargo at sea. The assistant also assigns boats and boat crews in compliance with the ship's boat schedule; supervises readiness of boats and survival equipment by frequent inspection; orders repairs or replacements as required (with the exception of power boat engines and engine compartments, which are the responsibility of the engineering department); directs preservation of weather decks, ship's exterior, running gear, ground tackle, and boatswains' stores; arranges for the training of deck divisions, scheduling drills and classes in deck seamanship, boat handling, and marlinspike seamanship; recommends transfer, reassignment, and promotion of deck personnel; directs the preparation of weekly, monthly, and quarterly reports as required; and maintains files and records for reference by deck divisions.

On a noncombatant ship, the duties and responsibilities of the first lieutenant are still the same; but as the department head, the first lieutenant becomes responsible for those duties that the weapons officer on a combatant ship must exercise.

ANTISUBMARINE WARFARE (ASW) OFFICER

Assignment as an ASW officer includes the following responsibilities:

General Duties. The ASW officer is responsible to the weapons officer for the employment, operation, and maintenance of all ASW equipment except as otherwise assigned.

Specific Duties. The ASW officer is responsible to the weapons officer for the proper performance of all ASW functions to include the following duties:

1. Conducting underwater ASW search and attack except when otherwise directed
2. Operation, care, and maintenance of all ASW equipment, including search and attack sonar, antiaircraft, weapons launching and fire control equipment, attack aids, torpedo countermeasures, underwater communication equipment used in the identification and classification of submarines, and ASW weapons launching and fire control equipment
3. In addition to supervising and training of personnel assigned to the ASW officer, supervising and training of such other personnel as are assigned ASW stations or duties
4. Acting as nuclear weapons officer for the battery (if nuclear capable) when no nuclear weapons officer is separately designated

GUNNERY OFFICER

Responsibilities of the gunnery officer include the following duties:

General Duties. The gunnery officer is responsible to the weapons officer for the employment, operation, and maintenance of all gunnery equipment.

Specific Duties. The gunnery officer is responsible to the weapons officer for the proper performance of all gunnery functions, except as otherwise specified, to include the following duties:

1. Conducting gunfire except when otherwise directed
2. Operation, care, and maintenance of all gun armament, including designation equipment, fire control equipment, weapons, associated ordnance, and attack aids used in firing and controlling guns
3. In addition to the supervision and training of personnel assigned, supervising and training of such other personnel as are assigned gunnery stations or duties

MISSILE OFFICER

Responsibilities as a missile officer include the following duties:

General Duties. The missile officer is responsible to the weapons officer for the employment, operation, and maintenance of all missile equipment except as otherwise directed.

Specific Duties. The missile officer is responsible to the weapons officer for the proper performance of all missile functions, except as otherwise specified, to include the following duties:

1. Conducting antisurface and antiaircraft missile attacks except when otherwise directed
2. Operation, care, and maintenance of all ship-launched missile armament, including designation equipment, fire control equipment, associated navigational equipment, weapons associated ordnance, attack aids, test equipment, and telemetering equipment used in firing and controlling missiles
3. In addition to supervising and training of personnel assigned, the supervising and training of such other personnel as are assigned ship-launched missile stations or duties
4. Acting as the nuclear weapons officer for the battery (if nuclear capable) when no nuclear weapons officer is separately designated

NUCLEAR WEAPONS OFFICER

Responsibilities as a nuclear weapons officer include the following duties:

General Duties. The nuclear weapons officer is responsible to the weapons officer for the safety, preservation, assembly, testing, inspection, surveillance, and processing of nuclear weapons and their associated equipment (less equipment installed in aircraft).

Specific Duties. The nuclear weapons officer is responsible to the weapons officer for the proper performance of all nuclear weapons functions, except as otherwise specified, to include the following duties:

1. Safety, testing, and handling of all nuclear weapons components assigned
2. Operation, care, and maintenance of all nuclear weapons and associated equipment, including test and handling equipment
3. Cleanliness, preservation, and security of all assigned nuclear weapons spaces
4. In addition to supervising and training of personnel assigned, the supervising and training of such other personnel as are assigned nuclear weapons duties

THE FIRE CONTROL OFFICER

The fire control officer assists the weapons officer by supervising and directing the personnel in the operation, maintenance, and repair of fire control systems. Additional responsibilities include assigning personnel to operation and maintenance duties on all weapons control equipment and systems; establishing and supervising training programs and drills; and supervising the preparation of the required records and reports for submission to and by the weapons officer.

SYSTEMS TEST OFFICER

Responsibilities of the systems test officer include the following duties:

General Duties. The systems test officer will be responsible, under the combat systems officer, for the integration and management of combat systems maintenance efforts, evaluation of combat systems material and operational readiness, and combat systems alignment.

Specific Duties. The systems test officer is responsible to the combat systems officer for the following duties:

1. Maintaining current knowledge of all prescribed combat system level standards of performance, and normal and casualty modes of operation.
2. Directing and functionally integrating combat system subsystems to achieve the optimum combat system material readiness status.
3. Maintaining maximum combat systems material readiness through management of corrective maintenance efforts of the combat systems. These efforts include the recommendation of maintenance priorities and scheduling of corrective maintenance requirements.
4. Coordinating with other departments the scheduling and execution of required maintenance in related support subsystems.
5. Keeping the combat systems officer, and other departmental officers, informed of the material readiness of the combat system(s) and the results of combat system(s) tests.
6. Assisting the combat systems officer in evaluating combat system(s) operational readiness.
7. Maintaining the proficiency of the ship's electronics readiness team. This is done by ensuring the well-rounded training of ship's electronics readiness team personnel and by recommending assignment of specific subsystem technicians to the ship's electronics readiness team.
8. Initiating and/or reviewing internal reports pertaining to the operation and material readiness of the combat system(s) and subsystems.

SHIP'S ELECTRONICS READINESS TEAM

General Duties. The electronics readiness team is comprised of specially trained enlisted subsystem technicians (usually E-7 or above). They are responsible to the systems test officer for evaluating the operational readiness and monitoring the care and maintenance of the installed combat system(s). This includes the unit's search and detection equipment, command and control equipment, and fire control equipment.

Specific Duties. The exact composition (number of personnel, rates, and ratings) of the ship's electronics readiness team varies. Consequently, the exact duties of the team vary with the technological configuration of the installed combat system(s).

WEAPONS DIVISION OFFICER

One collateral duty to be assigned, in addition to the primary duties described above, is that of weapons division officer. The weapons division officer assists the weapons officer by administering a division of the weapons department; directing the operation, maintenance, and repair of division equipment; assigning personnel to weapons and deck duties; maintaining the watch, quarter, and station bill; establishing and supervising a training program for assigned weapons personnel; scheduling drills and organizing firing practices; ensuring readiness and cleanliness of division equipment and assigned spaces, personally inspecting the battery and supervising major alterations and repairs; directing care, handling, stowage, and use of battery ammunition; issuing weapons doctrine according to directives of the weapons officer; supervising division personnel, administering liberty, leave, and transfers; and overseeing preparation of division records and reports. The duties to which the officer is assigned and the sum of those duties are dependent upon the command's needs and the type commander's standard organization.

The basic duties of the division officer, as well as other officers, are more clearly defined in OPNAVINST 3120.32, *Standard Organization and Regulations of the U.S. Navy*. To maintain continuity in this chapter, we will discuss the basic functions of a division officer as outlined in OPNAVINST 3120.32A.

DIVISION OFFICER

A division officer is one regularly assigned by the commanding officer to command a division of the unit's organization.

A division officer will carry out the following duties and responsibilities:

1. Be responsible to the department head for the proper performance of the duties assigned to the division; be responsible for the conduct of subordinates, as per regulations and orders of the commanding officer and other superiors.
2. Keep informed of the capabilities and needs of subordinates; as authorized, take such action as may be necessary for the efficiency of the division and the welfare and morale of the subordinates.

3. Train subordinates in their own duties and in the duties to which they may succeed; encourage them to qualify for advancement and to improve their education.

4. Suppress any improper language or unseemly noise or disturbance.

5. Report to the executive officer, via the department head, all infractions of regulations, orders, and instructions deserving of disciplinary action.

6. By personal supervision and frequent inspection, ensure that the spaces, equipment, and supplies assigned to the division are maintained in a satisfactory state of cleanliness and preservation.

7. Report promptly to the department head any required repairs that cannot be made or other defects that cannot be corrected.

8. Carefully instruct subordinates in all applicable safety precautions; require strict observance of those precautions.

9. Maintain an up-to-date copy of OPNAVINST 3120.32A and other orders for the division; ensure that pertinent parts of this instruction are posted where they will be accessible to subordinates.

10. Ensure optimum material conditions of readiness within the division.

11. Supervise the administration of Personnel Qualification Standards (PQSs) (if PQSs have been implemented) within the division; provide personnel with guidance and incentives for the accomplishment of PQSs. Select and designate petty officers qualified to authenticate completion of individual PQSs.

In ensuring these duties are performed, the division officer is directly responsible for the following duties:

1. Directing the operation of the division through leading petty officers, as prescribed in the division organization.

2. Assigning personnel to watches and duties within the division; developing rotational programs for battle stations, watches, and general duties to ensure the training and proficiency of assigned personnel.

3. Scheduling and conducting training for personnel assigned to the division. Phases of division training should include indoctrination of new personnel; preparation for advancement in rating, including correspondence courses and practical factors in both military and professional subjects; individual instruction and drills in unit duties; team training to fulfill operational requirements of the division; instruction in principles of effective leadership; and individual training through Defense Activity for Non-Traditional Education Support (DANTES). In accomplishing this function, the division officer receives guidance from the educational services officer.

4. Initiating enlisted performance evaluation sheets for personnel in the division.

5. Maintaining a division notebook containing personnel data, training program data, a space and equipment responsibility log, and the watch and battle stations required to be manned. The notebook should also contain such other data as may be useful for the orientation of a relieving officer and for ready reference.

6. Maintaining all forms, reports, and correspondence originated or used by the division.

7. Establishing and maintaining a division organization manual and other directives for the administration of the division.

8. Ensuring that prescribed security measures are strictly observed by personnel in the division.

9. Making recommendations for personnel transfers and changes in the division allowance to the department head.

10. Forwarding requests for leave, liberty, and special privileges, with recommendations.

11. Conducting periodic inspections, exercises, and musters to evaluate performance and discipline of division personnel and to initiate disciplinary action, when deemed necessary according to the Uniform Code of Military Justice and other regulatory directives.

12. Cooperating with other division officers in the department; recommending improvements in departmental policies and procedures to the department head.

13. Supervising the administration and performance of the work centers within the division in carrying out the shipboard maintenance and material management system.

14. Ensuring that all damage control equipment, fittings, and checkoff lists in the assigned spaces are maintained in proper working condition and are properly labeled.

ENLISTED RATINGS IN THE WEAPONS DEPARTMENT

The typical missile destroyer will probably have a great majority of the ordnance ratings aboard. Personnel assignment will be, in a large part, governed by Navy enlisted classification codes (NECs). NECs are not discussed in this chapter, but will be described fully in a later chapter. At this point, you only need to understand that the NEC number will describe what particular qualifications are within each individual's rating structure. These ratings are exclusive of the particular NEC describing systems qualifications:

Undesignated Seamen Apprentices (SAs) and Seamen (SNs). These are the raw personnel material primarily of the deck division(s). A seaman who becomes a designated striker for one of the weapons ratings, by any one of several methods, is placed in one of the technically oriented weapons divisions.

Boatswain's Mate (BM). This rating is assigned to the deck division(s) of the weapons department. The duties of the BM are many and varied but primarily involve all phases of deck seamanship.

Gunner's Mates (GMs). Depending on the class of ship, either Gunner's Mate Guns or Gunner's Mate Missiles, or both, are on board. The technical duties of GMMs are related directly to the care, maintenance, and operation of their respective launching equipments. GMGs are responsible for the care, maintenance, and operation of the Basic Point Defense Surface Missile System in addition to the gun-type weapons. Until recently, GMGs also had responsibility for the ASROC launching system. This is now the responsibility of GMMs.

Fire Controlman (FC). This rating is divided according to NECs to cover the broad field of fire control radar systems, designation systems, and computers. The FC rating also has responsibility for gun- and missile-oriented systems.

Torpedoman (TM). This rating has responsibility for all tube-launched torpedoes and associated equipments.

Sonar Technician (ST). This rating, which is not an ordnance rating, usually is assigned to the weapons department. STs are responsible for all underwater accoustical search and communication equipment.

On other combatants, you will find other ordnance ratings assigned that are not normally assigned to the destroyer class vessel. Of course, most of the ratings can, and do, fill billets on different types of ships. However, some of the ratings are rather unique. These ratings are as follows:

Fire Control Technician Ballistic Missiles (FTB). This rating is responsible for all fire control computers and associated equipments in ballistic missile systems. The FTB will not be assigned, other than for shore duty or school assignments, to other than an FBM submarine tender or an FBM submarine.

Weapons Technician (WT). This rating has the responsibility for maintenance and operation of all nuclear weapons equipments and associated equipments, and for the care and maintenance of the weapons. A recent addition to the responsibility of the GMM rating is the care, maintenance, and operation of the ASROC launching system. Normally, this rating is assigned to a destroyer tender or a larger ship.

Data Systems Technician (DS). This rating is found aboard ships having a combat systems department. DTs are the computer technicians of the Navy and are responsible for the repair and operation of the complex computer network in today's modern fighting ships.

Mineman (MN). This rating has the responsibility for all surface- and air-launched mines and associated equipments (we are purposely excluding submarine-launched mines from this discussion) and countermeasure equipments.

As can be seen from the above listing, the weapons officer has to be constantly aware of advances to various weapons systems and onboard weapons. This officer should have, for the minimum, a basic knowledge of the various problems and capabilities inherent in each weapon system.

ORGANIZATION MANUALS

This subject was discussed briefly in the section dealing with departmental organization. Here we will attempt to consolidate some of the information in the basic manuals you, as the weapons officer or as a weapons division officer, should know.

Development of an efficient and flexible organization to provide for effective assignment and use of personnel—individually and collectively—is a sign of forceful and intelligent command management.

Organization manuals are used to disseminate information to personnel and to maintain a record of assignments. On board any ship as many as four separate classes of organization manuals may be used.

SHIP'S ORGANIZATION AND REGULATIONS MANUAL

The *Ship's Organization and Regulations Manual* is the directive governing the administrative organization (including watches) of the ship. It also governs the coordination of ship's departments in general evolutions and emergencies and the conduct of personnel aboard the ship. The primary purpose of this manual is to provide ship's personnel with a ready source of authoritative information concerning the duties, responsibilities, and authorities in the administration of the ship. The *Ship's Organization and Regulations Manual* is prepared by the type commander charged with administrative control of the ship. In preparing an organization manual, the type commander must allow for the tasks assigned, quantity and quality of personnel available, and other considerations peculiar to each type or class of ship. Therefore, a separate organization manual is prepared for each distinct ship type assigned to the command.

The *Battle Organization Manual*, as the title implies, is the directive that governs the battle organization of the ship. The purpose of this manual is to organize the ship for battle and wartime cruising. It assigns personnel to duty stations under the various conditions of readiness and, additionally, provides information on the interior communication systems between battle stations. A separate battle organization manual is prepared by the type commander for each ship type or class assigned to the command.

Department organization manuals and division organization manuals provide the authority for department heads and division officers to delegate authority and assign basic responsibilities to subordinates. These manuals supplement the *Ship's Organization and Regulations Manual* with a detailed organization for each department and division. Not all ships are required to prepare department and division organization manuals. In smaller ships, the department organization manual may serve to describe the organization structure down to the lowest supervisory level. In such cases separate division organization manuals are needed.

REFERENCE LIST

Battle Organization Manual, NWIP 50-1(D), Office of the Chief of Naval Operations, Washington, DC, December 1974.

Organization of the U.S. Navy, NWP 2, Office of the Chief of Naval Operations, Washington, DC, November 1982.

Standard Organization and Regulations of the U.S. Navy, OPNAVINST 3120.32A, Office of the Chief of Naval Operations, Washington, DC, March 1979.

United States Navy Regulations, 1973, Office of the Secretary of the Navy, Washington, DC, February 1973.

CHAPTER 2

ADMINISTRATION

Administrative procedures are planned and executed on the basis or the tenet that every command or organization must have a reason for existence and that the personnel of the command and organization should be aware of that reason. Most of us know that any unit's or command's primary objective is to be ready for action in time of war. This objective requires us to maintain our units in the highest practicable state of readiness.

All officers must attempt to improve the readiness of the units within their areas of responsibility. To be prepared to fulfill this duty, each officer must have a clear understanding of the meaning of administration and the responsibilities involved.

INTRODUCTION

In this chapter, we will discuss administration as it affects a ship's bills and the watch organization. Also discussed are the use of policies and directives and the type of records that are used by the weapons department. You will learn about critical inspections that involve the weapons department and the publications used in preparing for these inspections. This chapter should be an excellent guide to prepare you for the administrative duties of a weapons officer.

ADMINISTRATIVE FUNCTIONS

Effective administration requires planning, organizing, commanding, and controlling. In this chapter we will show you that your organization can be made to work more smoothly if you, as weapons officer, have a thorough knowledge of the interrelationship between the "paper-working" system and the art of leading. The two major tenets of naval leadership are that to be a good officer you must know your personnel and take care of them, and you must know and do your job. Here we are concerned primarily with the latter, but the former must never be forgotten. Many officers are skilled in one area or the other, but you can attain excellence only if you are efficient and effective in both.

As a department head, you will have a close working relationship with the other department heads, the executive officer, and the commanding officer. You will take part in conferences and discussions preliminary to scheduling the ship's activities. Although command decisions are strictly within the purview of the commanding officer, your suggestions and ideas will be solicited. In matters related to your department, you may confer directly with the commanding officer whenever such action is deemed necessary for the good of the department or the naval service. Navy regulations require that you keep the commanding officer informed as to the general condition of machinery and other installations of your department, and especially of any condition which may adversely affect the safety or operation of the command. However, in routine matters you are required to inform the executive officer of your desire to discuss with or make a report to the commanding officer. The executive officer will then decide whether a direct conference is necessary or whether it is best to advise the commanding officer of the situation.

In relationships with the other department heads, your major responsibility is to integrate the objectives of the weapons department with those of other departments to meet the commitments of the ship as a whole. At times, it may become necessary to subordinate departmental goals when they conflict with the interests of the other departments. One thing to bear in mind is that a spirit of cooperation at the higher levels will encourage cooperation at other levels and will result in a smoothly running organization.

One of the most important aspects of administration is the ability to organize. To mold an organization into a sound, functional unit, administrative procedures must be outlined to accomplish specific necessary functions. An important organizing factor is the human element with emphasis on qualifications of individuals. An often-heard complaint is that younger officers and petty officers are inexperienced and lack ability in their divisional duties. This may be true, but they can obtain that experience only under the direction of competent seniors. Too often an enthusiastic junior officer is told to comply with a mass of directives from multiple "higher authorities" and is not given adequate guidance to comply with the directives. The officer ends up confused, frustrated, overworked, and disheartened. From there, it is a gentle downhill slide to lack of enthusiasm and loss of ambition. Personnel who are competent to solve problems and successfully carry out solutions should be given every opportunity to do so. In so doing, they will enjoy personal growth and satisfaction and will thus contribute even more to the general organization and morale aboard ship.

Only by knowing your subordinates is it possible to evaluate their talents and limitations and to properly place them. Concern about your personnel must be continuous, not just occurring when they get into trouble or are about to ship over. All personnel must have assurance that their progress, their training, their careers, and their performance of duty are of concern to their superiors. This chapter will assist you in helping your subordinates find their way through the morass of administration and to understand it.

Administration falls generally into two major areas: (1) that which operates on material status in various ways, that is, SAIL reports, correspondence, and some ship's bills; and (2) that which directly affects the personnel of your department, that is, training, review of service jackets for various purposes, and recommendations for advancement in rating. For effective performance in these two major areas, records must be filed and indexed, and procedural methods for handling them must be developed. Operating throughout both areas are directives from higher authority that must be obeyed. To operate efficiently, you must reduce needless duplication of records and follow rigidly the standard filing system of the Navy. This filing system is discussed more fully later. Always remember that administration is a means to an end, not the end itself.

SHIP'S BILLS AND WATCH ORGANIZATION

A ship's bill establishes the policy for the assignment of personnel to duties or stations for the purpose of executing specific evolutions or accomplishing certain functions. Assignments for these evolutions are made by a cognizant officer to the watch, quarter, and station bill, and other pertinent bills. Type commanders will furnish their ships with additional information, if necessary, to permit detailed assignment of personnel.

Generally, a ship's bill must supply sufficient guidance to the division officer or cognizant officer to permit assignment of personnel by name. A bill consists of the following parts:

1. Preface. This part contains a statement of the purpose of the bill, an assignment of responsibility for maintenance of the bill, and background of a guidance nature.
2. Procedure. This part contains all information and policies necessary to interpret the tabulated material and all special responsibilities of personnel with regard to planning, organizing, directing, and controlling the evolution to which the bill relates.

STANDARD UNIT BILLS

Bills common to all units can be found in OPNAVINST 3120.32A, *Standard Organization and Regulations of the U.S. Navy*. Bills common to all units, but not included in the organization and regulations manual, are the watch, quarter, and station bill and the battle bill. The watch, quarter, and station bill is actually an amplification of other bills. The battle bill is part of the battle organization manual and details of its preparation are covered in Naval Warfare Information Publication (NWIP) 50.1.

Watch, Quarter, and Station Bill

The watch, quarter, and station bill is the division officer's summary of assignments of personnel as to their station/duties. Its primary purpose is to inform division personnel of their assignments within each of the unit's bills. This bill is arranged in a standard tabular form. Columns are provided for entering data from each of the unit's bills with a standard reusable panel. The card strips used are available through the naval supply system, thus eliminating repeated reconstruction of these bills as changes occur.

The division officer keeps the working copy of the watch, quarter, and station bill in a division notebook. This notebook is updated as required. It is of considerable assistance in transferring data from the unit's bills to the watch, quarter, and station bill. It should be noted that certain assignments to watches and duties, such as watches in port, are not on the watch, quarter, and station bill but are published on a periodic watch list.

Administrative Bills

Administrative bills include the following: personnel assignment bill; berthing and locker bill; cleaning, preservation, and maintenance bill; formation and parade bill; classified material control bill; orientation bill; personnel recall bill; security bills; and the zone inspection bill. These bills as listed by their titles are self-explanatory; however a brief discussion of a selected group will follow. For a more comprehensive overview of these bills refer to OPNAVINST 3120.32A, chapter 6.

PERSONNEL ASSIGNMENT BILL.—This bill was designed to establish responsibilities and procedures for the assignment and reassignment of officers and enlisted personnel. It is prepared by the type commander for each class of ship.

The executive officer is responsible for this bill and should ensure that it is kept current.

The Chief of Naval Operations (CNO) is engaged in developing a series of manning documents for all ships. These documents are called ship manning documents (SMDs) or squadron manning documents (SQMDs). They detail the rationale for manning of ships and squadrons. This type of manning, as referred to in the SMDs, is termed organizational manning. SMD implementation will be realized by a revision to the individual unit's manpower authorization (OPNAV 1000/2) to reflect organizational manning. Keep in mind that an SMD is only advisory in nature. Actual organization and assignment of personnel continue to be command responsibility. Under circumstances where sufficient manpower will not become available in the foreseeable future, conditional manning may be required. This will generally occur as outlined in OPNAVINST 1000.16E. Keep in mind that a ship is undergoing changes. These changes, such as additions to missiles, new gun systems, ASW systems, and so forth, will require changes to the personnel assignment bill.

BERTHING AND LOCKER BILL.—The berthing and locker bill provides the procedure for assignment of personnel to berthing and locker facilities. Normally there is one berthing and locker bill for peacetime and another for wartime. Under these circumstances, the following considerations govern the allocations for facilities to divisions and assignments of berths to individuals.

1. In peacetime, division administration and morale
2. In wartime, proximity to battle stations and dispersal of key personnel

CLEANING AND MAINTENANCE BILL.—The type commander's standard for cleaning and maintenance will necessarily require modification and amplification by commanding officers to allow for individual ship differences between types and within types. In the bill there is a listing of the ship's spaces and the division assigned to maintain each space.

ORIENTATION BILL.—The purpose of this bill is to provide required procedures for the indoctrination of newly reported enlisted personnel. Usually aboard ship, the I-division officer, as directed by the executive officer, is responsible for implementing and maintaining this bill.

All personnel in pay grades E-1 through E-4, when first reporting aboard, will be assigned to the I division for their initial indoctrination and training. It is in the I division that newly reporting personnel will become aware of their individual responsibilities, duties, and opportunities. They will also become acquainted with departmental functions with their various locations throughout the ship. These first few days aboard ship are most important for newly reporting young men and women. A good indoctrination program cannot be overemphasized.

As mentioned before, we are not going to do a comprehensive explanation of each individual bill. A few bills have been lightly touched upon. For a more complete description of each bill, refer to OPNAVINST 3120.32A, chapter 6.

Operational Bills

Included as operational bills are the boat bill; civil disaster bill; cold weather bill; darken ship bill; dry docking bill; EMCON bill; flight operations bill; heavy weather bill; helicopter operations bill; helicopter inflight refueling bill; intelligence collection bill; ship's self-defense force bill (has replaced the old landing force party); navigation bill; replenishment bill; rescue and assistance bill; rescue of survivors bill; equipment tag-out bill; diving bill (divers); ships silencing bill; shore fire control party bill; special sea and anchor detail bill; emergency towing bill; and visit and search, boarding and salvage, and prize crew bill. Operational bills are numerous and quite varied in subject matter. A few of these bills will be discussed in this chapter; they will affect the weapons department more so than the others. Again, for a more detailed discussion of all the bills listed, refer to OPNAVINST 3120.32A, chapter 6.

SPECIAL SEA DETAIL BILL.—You, as a weapons officer or deck officer, are responsible for maintaining this bill. The purpose of this bill is to establish policies for assignment of personnel to stations and duties during periods when the ship is underway in restricted waters, and to make preparations for getting underway or returning to port. The special sea and anchor detail supplements the regular steaming watch. In some instances, special sea and anchor detail personnel will relieve the regular watch. Usually personnel assigned to this bill are highly trained in their assigned watch stations (helm, lee helm).

REPLENISHMENT BILL.—The first lieutenant is responsible for this bill. Naval Warfare Publication (NWP) 14, *Replenishment at Sea*, provides the necessary doctrine for this evolution. Fueling and transfer of light cargo or personnel often occur simultaneously, but the handling of heavy cargo and ammunition is a separate operation.

The rigging and stations differ with the evolution, but the personnel involved are the same. Foresight and planning are the key words in using this bill. You should be able to anticipate problems and be prepared to handle them.

SHIP'S SELF-DEFENSE FORCE BILL.—The weapons officer is responsible for maintaining this bill. The purpose of the self-defense force is to provide a surge capability for reacting to emergency security situations aboard ship and at pierside to protect the ship, its personnel, and its sensitive equipment. You should use discretion when selecting personnel for this force. Personnel selected must be mature, reliable, and knowledgeable in the use of small arms, interior guard, and riot control procedures. On larger ships with a Marine security detachment, the detachment will normally fulfill this function. The size of the force is determined by the size of the ship's crew, with a ratio of a 13-man squad to 200 crew members. Whenever self-defense force personnel are relieved from afloat watches and special duties, the defense force is activated or on a standby status.

RESCUE AND ASSISTANCE BILL.—The engineering officer is responsible for this bill. The nucleus of personnel assigned to duties within this bill consists of those ratings that are best qualified to direct procedures in such matters as rescue from the water and assistance to units in distress. The security of the unit should be of paramount consideration when dispatching rescue and assistance details away from their unit. Search and rescue doctrine is contained in NWP 37.

VISIT AND SEARCH, BOARDING AND SALVAGE, AND PRIZE CREW BILL.—In this bill, the operations officer is usually in charge. Personnel assigned to this bill are responsible for visiting and searching, boarding and salvaging, and remaining aboard as a prize crew, if necessary.

No other operational bills will be discussed at this time. For further information on this bill refer to OPNAVINST 3120.32A.

Emergency Bills

This group of bills covers emergency situations. A listing of emergency bills that are common aboard ship follow:

- General emergency bill
- Aircraft crash and rescue bill
- Emergency steering bill
- Jettison bill
- Man overboard bill
- Nuclear reactor plant casualty bill
- Nuclear weapons accident/incident bill
- Toxic gas bill
- Nuclear reactor security bill

Their titles are self-explanatory. Not all of these bills will be covered in this chapter; a few bills will be discussed that are pertinent to the weapons officer. For a more descriptive explanation of these bills refer to OPNAVINST 3120.32A, chapter 6.

GENERAL EMERGENCY BILL.—The purpose of this bill is to establish and provide an organization, prescribe procedures, and to assign responsibilities for controlling the effects of a major emergency or disaster suffered by a ship, such as collision, grounding, internal and external explosion, NBC contamination, earthquake, storm, or battle damage. Every officer and enlisted person must be familiar with their ship's damage control organization and its responsibilities. In this bill, damage control must be recognized as the common responsibility of all hands aboard ship. The very life of the ship and of the crew will depend upon its effectiveness.

The engineering officer is responsible for maintaining this bill and ensuring that it is current. This bill provides provisions to handle the ship with or without the full crew aboard.

NUCLEAR WEAPONS ACCIDENT/INCIDENT BILL.—The weapons officer, assisted by the nuclear safety officer, is responsible for the maintenance of this bill.

A nuclear weapon accident/incident is either a potential or an actual casualty to a nuclear weapon or its related system that could endanger the ship's personnel or provide a hazard to the ship or its equipment. The following conditions are a listing of events that could provoke a nuclear weapon accident:

- Accidental or unauthorized launching, firing, or use by U.S. forces or by U.S. supported allied forces of a nuclear capable weapons system that could create the risk of war
- Nuclear detonation
- Nonnuclear detonation/burning of a nuclear weapon
- Radioactive contamination
- Seizure, theft, or loss of a nuclear weapon or component, including jettisoning
- Public hazard, actual or implied

The following listing includes significant nuclear weapons incidents. We consider a significant incident as an unexpected event involving nuclear components or weapons that does not fall in the accident category but:

- results in evident damage to a nuclear weapon or nuclear component to the extent that major rework, complete replacement, or examination or recertification by the AEC is required; or
- requires immediate action in the interest of safety or which may result in adverse public reaction (national or international) or premature release of information; or
- has such potential consequences as to warrant the informational interest or action of CNO or FLTCINC (as appropriate) and others in the military chain of command.

There is one area left to discuss and that is a nuclear weapon incident. This is defined as any unexpected event involving a nuclear weapon or component (including training weapons and associated test and handling equipment) resulting in any of the following situations:

- Incidents whereby the possibility of detonation or radioactive contamination is increased.
- Individual errors committed in the assembly, testing, loading, or transporting of equipment; or the malfunctioning of equipment and material that could lead to an unintentional operation of all or part of a weapon arming or firing sequence.
- Individual errors committed in the assembly, testing, loading, or transporting of equipment; or the malfunctioning of equipment and material which could lead to substantially reduced yield or increased dud probability.
- Any act of God (natural phenomenon, over which man has no control) resulting in damage to a weapon or component.
- Any unfavorable environment or condition which causes damage to a weapon or component.
- Any unfavorable environment or condition, produced in any manner, which subjects a nuclear weapon to vibration, shock, stress, extreme temperature, or other environment sufficient to cause reliability or safety of the type of weapon involved to be questioned in any way. This includes exposure or suspected exposure of the weapon or major components to electrical or electromagnetic energy which could energize or damage weapon components.

It is because of the sensitivity of nuclear weapons and the possible effect that even a small incident can have on public relations that this bill is of the utmost importance. This bill is designed to provide the necessary personnel, equipment, and outside assistance necessary to remedy any casualty that might occur, and cannot be overemphasized.

SPECIAL BILLS.—This is the last area to be discussed. These bills are also self-explanatory by nature of their titles. We have only listed a few of these bills; for further information refer to OPNAVINST 3120.32A, chapter 6.

- Anti-sneak/anti-swimmer attack bill
- Evacuating civilians bill
- Prisoners of war bill
- Troop lift bill

Watch Organization

Personnel assigned to watch-standing duties are entrusted with the safety of the ship, its machinery, and the personnel embarked. Confusion or conflict among watch personnel concerning responsibilities or authority could result in a collision or grounding, or even loss of the ship. A ship's watch organization is second in importance only to its organization for battle.

An important part of the *Ship's Organization and Regulations Manual* is the section devoted to the watch organization—both the normal peacetime underway watch and the inport watch. This section outlines the general duties and responsibilities of each member of the standard watch organization, and states which shipboard group will provide the watch standers. The duties and responsibilities of the watches assigned to a single department or division usually are amplified by the applicable department or division organization manual. The senior watch officer, under the direction of the executive officer, is responsible to the commanding officer for the assignment and general supervision of all deck watch standers, both underway and in port. The department heads furnish lists of qualified personnel for departmental deck watches to the senior watch officer.

POLICIES AND DIRECTIVES

Directives are basic tools of military management that provide a means of transmitting the plans and policies of executive personnel to all levels of the organization. They also serve as the guidelines that control the decisions and actions of subordinates in the organization. A ship's directives system must provide for the wide dissemination of the policies of the commanding officer and those of other commands responsible for the operation of the ship. The directives system must also provide a medium for subordinate officers to issue amplifying and supplementary instructions for placing these policies into effect.

OPERATIONAL AREA POLICIES

Policy and guidelines in this area are established by the operational plan (OPLAN). This is a directive issued for accomplishing operations extending over a large geographical area and usually extending over a considerable period of time. An OPLAN relates to the weapons officers' duties in a rather indefinite way; they should understand that the particular orders under which their ship operates have their philosophical base in the OPLAN, to use the term, philosophical, in a very narrow sense.

Ordinarily an OPLAN is based upon, and therefore restricted by, various assumptions. It is prepared well ahead of the impending operation, or it may state that it becomes effective when so ordered by appropriate authority. The OPLAN is the instrument upon which subordinate commanders base operational orders (OPORDs) to their commands covering the specified tasks assigned.

Operational Order

An OPORD is a form of directive issued by a commander to subordinates to coordinate effective execution of a specific operation. There are no assumptions included in the OPORD and, unless otherwise stated, it is effective from the time and date specified. The format of the OPORD, which is discussed below, will in most cases be similar to that of the OPLAN, usually in booklet form. On occasion, however, it may be nothing more than a one-page communication.

Annexes, appendices, and tabs are supplementary parts of an OPORD. The annexes are subtitled Concept of Operations, Schedule of Events, Special Instructions, Cruising Instructions, Search and Rescue, Antiair Warfare Plan, Battle Plan, and Training Exercises, to name a few. Each of these annexes may have an appendix in which portions of the annex material are amplified in much the same way as the annex expands on the basic directive.

When it is necessary to amplify a portion of an appendix, a separate page is added as a tab. To illustrate, a tab might be referred to as Tab A to Appendix II to Annex Echo, and might include formation diagrams for particular maneuvers. Of course, the above citation will be to a particular commander's numbered OPORD. Another illustration could be Tab A to Appendix III to Annex Foxtrot; it might consist of frequency assignments for ultrahigh-frequency (UHF) equipment.

At first glance it wouldn't seem necessary that the weapons officers be familiar with the great majority of the OPORD annexes, appendices, and tabs. However, they should be familiar with many of them in regard to their nature. For instance the appendix which deals with communications will include several CIC radio nets that are vitally important to them, such as the antiair warfare net and the missile/gunfire coordination net. This last example serves to illustrate that the weapons officers, although they do not need to know the entire OPORD, will have to know on a selective basis many different parts of the OPORD.

Personnel Area Policies

The number of instructions and notices in this particular area is legion. As weapons officer, you will be intimately concerned with the welfare, training, and employment of your personnel. An important reference in this area is the *Naval Military Personnel Manual* (MILPERSMAN), NAVPERS 15560. All aspects of your career, as well as your personnel's, are covered here. In addition to these basic directives, there are a multitude of instructions and notices with which you must be more than familiar.

The basic objective of personnel administration is very broad; in fact, too broad to be covered adequately in this type of text.

The Navy Directives System

The Navy Directives System is a simple and uniform plan for issuing, maintaining, and filing directives, and for making the location of and reference to directives a relatively rapid process.

Two types of directives are issued under the Navy Directives System.

1. *INSTRUCTIONS* contain information of a continuing nature or information that requires continuing action. They are also used to direct action that cannot be completed in the near future, or that is dependent on the occurrence of a specific event. Instructions have a long-term reference value and continue in effect until canceled by the originator.

2. *NOTICES* are directives that are effective for only a short period. They require action that can be completed on receipt or contain announcements and items of current interest. A notice does not normally have a long-term reference value and must contain provisions for automatic cancellation on a prescribed date or under a certain condition, such as when the action they direct is completed.

Both instructions and notices are given identifying numbers according to their subject. These identifying numbers are listed in Section III, List of Standard Subject Identification Codes, SECNAV Instruction 5210.11C, *Department of the Navy File Maintenance Procedures and Standard Subject Classification Codes.*

An alphabetical listing of the subject content for Navy Department directives that are in effect as of 30 June is published semiannually under the title *Department of the Navy Directives Issuance System Consolidated Subject Index*, NAVPUBNOTE 5215.4. This index, which has separate sections for unclassified, Confidential, and Secret instructions, is issued to assist in identifying departmentally originated instructions on any desired subject. The unclassified section provides a guide to the subject matter of unclassified instructions issued by components of the Navy Department and distributed outside the originating office. Whether or not the instruction listed here is meant for your ship as an addressee can be checked by going to the checklist for the Standard Navy Distribution List number.

The Consolidated Check List, NAVPUB Instruction 5215.3, is compiled at the same time as the subject index above. The checklist is not to be used as an authority for upgrading or downgrading instructions or for making cancellations. The format of the listing is as follows:

Identity of Inst. Originator	Security	Inst. No.	Revision	Change or Supplement
OPNAV	0	8011.7	B	1

The foregoing example is self-explanatory.

Both the checklist and the subject index have quarterly supplements issued.

Type commanders also publish a listing of their effective instructions. You should become very familiar with these listings. They, too, will be filed as notices, and under 5215.1C.

Correspondence

Procedures for correspondence preparation can be found in the Department of the Navy *Correspondence Manual*. Most of the correspondence that leaves the ship will be prepared by the captain's office. This holds true even in technical areas that are directly within your purview. You will probably be required to draft a letter in the rough, have it typed (double-spaced), and then submit it to the commanding officer for comment. The commanding officer will most likely have his or her own Yeoman prepare the smooth letter. As with most of your duties, follow up and make sure it's done.

Naval Messages

Radio messages are routed to personnel in more or less the same manner, except that the communication watch officer makes the routing decision. There are few problems associated with routing unclassified messages, but classified messages require some sort of security control. You are interested in seeing that the right people get the word, but you don't want those classified messages floating all over the ship. One method of dissemination would be to keep the Confidential messages on a clipboard in the office with instructions for all departmental officers to check the board each day. Space would be provided on the message for the action officer's initials, and provisions should be made to keep the clipboard under lock and key. Secret and higher classification messages will most likely be routed personally or hand-carried between officers who have a need to know. Instructions in this area can be found in the *Department of the Navy Information Security Program Regulation*, OPNAVINST 5510.1.

Navy Filing System

To locate and file correspondence properly, a standard filing system is extremely important because of personnel changeovers via transfer, discharge, and so forth. In general, the Navy uses a combination of two codes, standard subject identification codes and name-title subject codes, which together cover all categories of files and are listed in SECNAVINST 5210.11. The standard subject codes are divided into thirteen major subject groups which are also listed in SECNAVINST 5210.11. Each subject group is identified by a four- or five-digit numeric code. For example, all ordnance material is listed in the 8000 series. Subject groups are subdivided into primary, secondary, and sometimes tertiary groups. Primary subjects are designated by the last three digits of the code number. Secondary subjects use the last two digits, and tertiary subjects the final digit.

For example:

Major subject—5000, General Administration and Management

Primary subject—5200, Management Procedures and Techniques

Secondary subject—5210, Methods and Paperwork Management

Tertiary subject—5211, Files and Records Systems

Ship's Directives

The text of all directives must follow a uniform format. Information on the preparation of directives and their prescribed format may be found in OPNAVINST 3120.32.

Under the Navy Directives System, all shipwide, departmental, and divisional instructions and notices are filed together in binders. They are arranged in sequence according to their subject classification numbers. Thus, all of the directives on a single subject are grouped together. By integrating shipboard directives at all levels of the organization, the Navy Directives System assists the commanding officer and the department heads in directing the units of the command more efficiently, and in coordinating all efforts toward the accomplishment of common objectives.

Directives are not the only means of communicating policy information within a shipboard organization. Their main advantage is that they provide a written record for future reference. Other ways of disseminating ship's policy or departmental policy are by means of discussion groups, conferences, short lectures at morning quarters, notices in the Plan of the Day, and so on. Material presented in this fashion is more easily assimilated, and there is an opportunity for authoritative and interpretive answers to specific questions. Directives are the primary means of policy communications; however, they should be readily accessible to at least all supervisory personnel. This may be accomplished by making the departmental and divisional directives manuals available to all hands or by posting pertinent directives in a central location. For assistance on the Navy Directives Issuance System, refer to SECNAVINST 5215.1C.

The ship's secretary has the overall responsibility to see that the Navy Directives System works on your ship. In addition to ensuring that the directives are issued in proper style and format, the ship's secretary is required to:

1. maintain the ship's master directives binder. This is a master set of all directives that are received by the ship, as well as those that are issued by the captain or executive officer. The master binder may be integrated with external and internal directives that are filed by subject classification number and originator. Because of their temporary nature, notices are not required to be filed in this binder; however, a good ship's secretary will probably do so.
2. operate the ship's directive control point. This is the term used to describe the system of issuing periodic checklists of effective instructions. The ship's secretary will have this checklist prepared and sent to all concerned at least once a year. If the volume of directives justifies it, the ship's secretary will have quarterly supplements completed listing all directives issued and those canceled during that quarter.

Directives that you initiate at the departmental level should be controlled in the same manner, except that you are the coordinator. The ship's secretary has nothing to do with your directives, except, perhaps, to advise you as to format or subject classification index.

A method should be set up to facilitate getting the word to your key personnel. Frequently, routing baskets or "pigeonholes" prove ideal. If you are on a large ship, you should assign letter codes to individuals if this has not already been done. Each key officer billet throughout the ship may have been assigned a letter code, and routing case lists may have been established in the Ship's Organization and Regulations Manual.

Security

Before you organize a classified material control system, it is recommended that you study OPNAVINST 5510.1G, *Department of the Navy Information Security Program Regulation*. Generally, the responsibility for handling classified matter involves receipting for, accounting for, making changes to, and distributing all such matter. The question of distribution is easily answered. Knowledge or possession of classified information is permitted only to those whose official duties make access to the information necessary, provided they have the proper security clearance.

The commanding officer may clear for Confidential clearance any active duty personnel provided the individual's personnel, medical, or other records are immediately available to the command issuing the clearance and they contain no derogatory information concerning the individual. The clearance usually is requested by the department head and should be based on the needs of the department. A successful national agency check (NAC) is required before a Secret clearance is granted; however, an interim Secret clearance can be granted pending the results of the NAC. For Top Secret, a background investigation (BI) must be conducted. Interim clearance can also be granted for Top Secret; and persons who have had a minimum of 15 years continuous active duty, plus a successful NAC, can qualify for a Top Secret clearance without a BI. The entrance national agency check (ENT-NAC) is an initial NAC conducted on all inductees and first term enlistees when they report for duty at basic training. This type of check is of concern only to recruit training commands, Marine Corps recruit depots, and specifically designated activities who order inductees or enlistees to active duty.

Civilians who desire clearance for Confidential must submit to an NAC. An NAC and a BI are required for Secret and Top Secret, respectively. If you are on a ship, such as a missile ship that is visited frequently by civilian company representatives, you should maintain a visitor's security clearance file. Classified visits will be conducted following OPNAVINST 5510.1 and applicable SECNAV instructions.

Security of the weapons office can be maintained by keeping the office occupied or locking it when no one is present. The office should be open during the day and just before the 8 o'clock reports in the evening. Make use of this centralized location to collect the 8 o'clock reports from your petty officers before you report to the executive officer. In port, an assigned weapons department duty officer makes the 8 o'clock reports to the command duty officer. An "up/down" equipment status board in the office will increase the accuracy of these reports, both in port and at sea.

A duplicate key for each weapons space (excluding magazines) should be kept in the office for access, should the need arise. Ships have found that a locked key locker, with the key in possession of the duty officer, provides access as well as security. The duty officer should also be in possession of the office key.

WEAPONS DEPARTMENT RECORDS

Records play an important part in the daily routine of the weapons department. It is important that they be carefully and correctly kept. Records can be used in a variety of ways. For example, when a new weapons officer reports aboard, records required to be maintained by the type commander or higher authority can provide the officer with an accurate picture of the status of ordnance equipment. Or, records of firing exercises may reveal weaknesses not otherwise disclosed. The condition of battery logs, if required, their legibility, completeness, and type of entries, might answer questions regarding the strength of the organization.

Ordnance efficiency has been improved over the years by alterations to equipment and by replacement with new improved equipment. Improvements are a direct result of performance analysis of equipment that is presently in use. These analyses must be based on accurate and complete data which are obtained to a great extent from shipboard weapons records. These records should provide a chronological account of all test, overhaul, repair, alteration, maintenance, and operating performance.

Ordnance History and CSMP Records

The changeover from the old maintenance system to the 3-M Systems has been accomplished. Old ordnance history cards and the current ship's maintenance project (CSMP) cards have been replaced by the maintenance data collection system (MDCS). Should you desire a complete list of all weapons department outstanding maintenance projects, it can be obtained from the type commander's data processing facility, maintenance support office department (MSOD) of the fleet material support office, IMA, and some individual ship data banks. From the 3-M central data bank maintained at MSOD, numerous reports are available to any command. These reports yield information concerning equipment maintainability and reliability, equipment alteration status, man-hour expenditures, material usage, and costs. In today's Navy, we have a wealth of information available.

Equipage Records

Although there is more detailed coverage of this subject in chapter 5 of this text, equipage is mentioned here because controlled equipage requires a record to be kept. Equipage items differ from equipment in that they are usually portable, high cost items that are highly vulnerable to pilferage. Items in this category include rain gear, foul weather jackets, portable test equipment, and so on. Controlled equipage requires an annual inventory as well as custody cards, NAVSUP Form 306.

Alterations Records

SHIPALTs, NAVALTs, and ORDALTs are mentioned briefly here; they are covered in more detail in chapter 4, "Shipboard Maintenance, Repairs, and Overhauls." SHIPALTs and ORDALTs are approved alterations to equipment that are under the cognizance of the Naval Sea Systems Command.

Alterations affecting the military characteristics of a ship may be approved only by the CNO, who also establishes their relative priority. All such alterations are classed as NAVALTs.

PMS Records

The planned maintenance system (PMS) is part of the 3-M Systems. A more detailed discussion of PMS will be found in chapter 4 of this text. It is mentioned here because the weapons officer is responsible for administering his or her respective portion. When installed, the PMS supersedes all previous maintenance systems or programs. To minimize record keeping, the ship now receives a computer printout not only of equipment part failures but also of equipment repairs made alongside a tender or while in the yard.

The PMS was not, however, designed to provide records but to provide a system of regular minimum maintenance. Your job, as Weapons Officer, will consist mainly of completing the quarterly maintenance schedule as well as reviewing and signing applicable equipment failure report forms; CASREPT, RUDTHORPE, and so forth.

Weapons Department Logs

A drastic reduction has been made in the requirement for logs to be kept and maintained aboard ship. Most rough logs have been completely eliminated, but the smooth log requirements still remain. To determine the requirements for log keeping aboard your ship, you should refer to the type commander's administrative inspection checkoff list.

Although there has been a drastic reduction in required logs, the following equipment may require smooth logs.

1. Gun mounts
2. ASW systems
3. Rocket launchers
4. Missile launchers
5. Torpedo batteries
6. Fire control systems
7. Small arms
8. Magazines
9. Battery alignments

To ensure proper log keeping, the weapons officer should prepare a weapons department instruction including enclosures outlining the proper keeping of each log. A copy of the enclosures pertaining to a log could then be attached inside the log's front cover as guidance for all concerned. You will find that this procedure pays handsome dividends, particularly during an administrative inspection.

Most often the weapons systems log contains sections devoted to the following items:

1. *Alignment*. Summaries of alignment data for each GFCS and MFCS, train checks, benchmarks established and recorded, roller path compensator settings, horizon checks, radar antenna alignment record, and so forth.

2. *Erosion*. Star gage data, erosion gage data, equivalent service rounds (ESR), pseudo equivalent service rounds (PESR), and a record of bore searching.

3. *Rounds Fired*. Entries in tabular form for each gun barrel by serial number showing rounds fired, type of projectiles, powder charge, powder index, and ESR.

4. *Rangefinder*. Record of RF calibration checks and adjustments, plots of the "A" curve for the rangefinder, and a smooth copy of each operator's "B" curves.

5. *Radar*. Dates and results of radar adjustments, collimation, calibration, and double echo checks. Any corrective measures taken, such as the negative range zero set from the double echo check results.

6. *Exercises and Rounds Fired*. Date and type of exercises or action firing. Overall results, plus a complete summary for unsatisfactory firing and corrective measures taken. List the arbitrary correction to hit (ACTH) or any other initial spot that was used.

MDS Records

The maintenance data system (MDS) is an integral part of the 3-M Systems. The MDS provides a means of recording information pertaining to maintenance actions (preventative or corrective) in a form suitable for machine processing. This permits evaluation of equipment performance and other pertinent information concerning maintenance actions. In addition to recording types of maintenance actions performed, the system provides data concerning the initial discovery of a malfunction, symptoms of equipment malfunction, how man-hours were expended, what repair parts were used, and so forth.

The forms used in recording maintenance actions and other data, as well as maintenance scheduling, will be covered in a later chapter. As weapons officer you will be administering the ordnance portion of this system. The records you keep will normally be a copy of each MDS record that is submitted to the ship's coordinator. It is pointed out here that although the 3-M Systems has been implemented, it is in a state of change so it is advisable to keep abreast of the most recent developments.

Weapons Department Correspondence Files

All incoming and outgoing correspondence from the ship will be filed in the ship's master serial file (central file) located in the captain's office. In the case of incoming correspondence, the ship's secretary will cause the original or copies to be routed to officers who have a "need to know." Many ships use duplicating machines to provide copies for permanent retention by the department heads. Usually, a cross-reference number is provided which locates applicable information in the master file. If you wish to retain an original temporarily, you should return the mail routing control slip to the ship's secretary with a noted explanation. If the letter is such that an answer should come from you and not the commanding officer, the ship's secretary should be informed of your compliance. Beyond this, only the type commander's minimum requirements should be met as to maintaining a correspondence file. As a weapons officer, you maintain files in addition to the files and records we have discussed previously. Some of the more important are (1) training, (2) overhaul, (3) personnel data, (4) inspection, and (5) tickler. Chapters 3 and 4 of this text broadly point out what items will be required in the files for training and overhaul.

Ammunition Ledger

The ammunition ledger is a type of ring binder containing ammunition stock record cards for each type of ammunition aboard ship. There are two forms available for ammunition stock recording. An ammunition Master Stock Record Card, NAVSUP Form 1296, and Ammunition Lot/Location Card, NAVSUP Form 1297, will be maintained for every naval ammunition logistics code (NALC) carried on board. When transferring to a new stock record card, the existing stock record card will be retained for audit purposes. All entries should be posted promptly and should be written in ballpoint pen. You will find the procedures and guidelines for preparing the ammunition stock recording cards in SPCCINST P8010.12.

Inspections

Administrative inspections check all administrative procedures, the availability of administrative materials, plus a spot-check of equipment condition. The degree of the latter check is at the discretion of the inspecting officer and is related to an inspection of the preventive maintenance procedures. The type commander's "admin" is the most involved, but the fleet training group also conducts an "admin" as a part of their arrival inspection. Arrival refers to the ship's arrival in the refresher training period, which is under control of the fleet training command. Don't forget, the most important aid in preparing for an "admin" is the type commander's administrative checkoff list.

The conduct of an administrative inspection requires a thorough knowledge of the type commander's requirements on the part of the inspecting party. The inspecting officer should concentrate on the substance of what is required rather than on the format, unless the format is definitely prescribed.

The best preparation for an administrative inspection is doing the daily work completely and without errors. You should start preparing for the inspection the same day the last inspection ends. If you adhere to the "admin" checkoff list throughout the year, then you'll have no problems in being ready.

The operational readiness inspection (ORI) usually is conducted in the final stages of refresher training (RFT). The ORI evaluates the ship's offensive and defensive capabilities. A comprehensive battle problem is part of the ORI. ORIs usually are conducted by personnel from a fleet training group, but may be conducted by the type commander's representatives at any time. Inspectors from either source are not content with a broad determination of the ship's effectiveness in battle. Quite the contrary, a good part of the inspection time is consumed by interrogating individuals. Questions are asked and simulated battle conditions are placed in effect to help the inspectors grade the individual's flexibility, versatility, and general training level.

A material inspection can be conducted by the type commander at any time. All equipment in your charge is checked for proper operation and to determine whether preventive maintenance measures are in effect. An INSURV (Board of Inspection and Survey) material inspection is also conducted at least once every 3 years. INSURV inspections usually are held before a shipyard availability period and are apt to be even more exacting than the type commander's inspection. Material discrepancies should be noted in the inspection file, the CSMP, the ship's integrated availability worklist, and the overhaul file, if applicable. It is not necessary to log discrepancies that can be immediately corrected by the ship's force but, of course, they may be included in the inspection file. INSURV inspections are covered in more detail in chapter 4 of this text.

Special naval technical proficiency inspections (NTPIs), nuclear weapons technical inspections (NWTIs), and nuclear weapons acceptance inspections (NWAIs) are the only Navy inspections concerning nuclear weapons capable ships. The NTPI is conducted by Navy inspectors to determine the activity's capability to accomplish its technical mission and, as appropriate, its adherence to standard procedures for storing, testing, assembling, maintaining, and handling nuclear weapons. An NTPI is conducted at least once annually. Fleet commanders may, in special cases, authorize an extension of up to 3 months, but such extension may not be authorized for 2 consecutive years. The standards, scope, and coverage of the NTPI must be, as a minimum, as specified in SWOP 25-1.

When practicable, NTPIs of fleet units should be conducted while ships are in their homeport during upkeep or leave periods. OPNAVINST C5040.6 contains instructions for NWAIs/NTPIs.

NWAIs are conducted on prospective Navy nuclear weapons activities to determine their readiness to perform those technical, administrative, and logistic procedures directly related to nuclear weapons. This may include a ship that has been in a yard for an extended period and subsequently has lost most of its trained personnel. The activity must receive a "satisfactory" grade before it is deemed fully operational.

NWTIs are held by the Defense Nuclear Agency (DNA) every 5 years. The purpose of these inspections is to ensure compliance with the Department of Defense (DOD) and joint service requirements. For further information on the DOD NWTI system, refer to SWOP 25-1.

NUCLEAR WEAPONS PUBLICATIONS

As more ships in the Navy become nuclear capable, the weapons officer must become very familiar with the special publications, distribution system, and reporting system that go along with this capability. This section has been placed here because of the special nature of the handling requirements and access requirements of nuclear material.

Field Command, Defense Nuclear Agency (FC, DNA) administers the Joint Nuclear Weapons Publications System (JNWPS) and approves atomic weapon manuals for conformance to and inclusion in the system. These publications are issued under the authority of the Director, DNA, and for Navy publications, the Secretary of the Navy.

The JNWPS is established to provide for the preparation, numbering, review, and maintenance of Joint Nuclear Weapons Publications (JNWPs). After the manuals are approved by FC, DNA, they are authenticated and identified by DNA and one or more of the services of the Department of Energy (DOE).

Publication Numbering System

This is a system providing unclassified short titles for JNWPs. The joint numbering system provides for the assignment of a two-part number to each publication and is in addition to the letter and number prefix. The system is divided into two subject categories, general and material. General publications are grouped and identified by SWOP 4-24, Nomenclature; SWOP 5-8, Unsatisfactory Reports/Information Reports; and SWOP 20-7, Nuclear Safety. Material subject publications are grouped and identified by a letter or letter-number combination indicating a weapon, major assembly, or equipment, such as SWOP B57-1, SWOP W 55.43-0. Publications pertaining to specific weapon system applications of a particular weapon are identified by the decimal numbers following the mark number as noted later.

The Navy identifies the JNWPs as Navy Special Weapons Ordnance Publications (NAVY SWOPs). The DNA and Atomic Energy Commission (AEC) identify the same publication as DNA TP. The Army prefixes their publications with Technical Manual (TM), and the Air Force with Technical Order (TO). The following examples show various publications numbers with each part of the number placed in an appropriate column for explanation:

Organization	Designation	Series	Subject Category	Serial
DNA	TP		4-	24
ARMY	TM	39-	W31.8-	1
NAVY	SWOP		T283-	2
AIR FORCE	T.O.	11N-	B61-	501

Publications pertaining to specific weapon system applications will be identified by decimal numbers following the Mk number; for example, NAVY SWOP W44.34-1 is the assembly and storage manual for the ASROC missile with the Mk 44 warhead. The decimal number (.34) indicates the ASROC application. A complete listing of decimal numbers assigned presently, and future application, is in NAVY SWOP 0-1, Numerical Index to JNWPs.

Navy SWOP 0-1

Navy SWOP 0-1 defines, lists and indicates the status of JNWPs. It is divided into eight sections.

- Section 1 gives information on the publication system and explains the listing of items contained in section 2.
- Section 2 is a listing of all manuals in the JNWPs.
- Section 3 is a listing of all explosive ordnance disposal (EOD) manuals.
- Section 4 gives a listing of all rescinded and superseded technical manuals.
- Section 5 gives a listing of all test and handling equipment.
- Section 6 gives a listing of all publications related to nuclear weapons logistics, supply cataloging, facilities, and physical security.
- Section 7 gives a listing of Joint Chiefs of Staff publications and reporting structure.
- Section 8 gives a listing of source data manuals issued by the DOE and DNA.

Distribution of Navy SWOPs

The Naval Ordnance Station (NOS), McAlester, Oklahoma, maintains a NAVY SWOP allowance list for each activity receiving NAVY SWOPs. This allowance list is kept current from the Naval Atomic Planning Support and Capabilities (NAPSAC) report, letter requests, and advanced planning information. Periodically, a copy of the allowance list is forwarded to the activity concerned for review. A copy is forwarded to the type commander where appropriate, so that reference can be made to publications held by a ship. Distribution of NAVY SWOPs is made by NOS McAlester by following the allowance list. NOS McAlester is the stocking and mailing point for all NAVY SWOPs except Explosive Ordnance Disposal Publications (EODPs). These are procured from the Explosive Ordnance Disposal Facility (EODF) at Indian Head, Maryland.

Changes and Revisions

Changes and revisions are issued, as necessary, to maintain technical accuracy of publications. The changes issued to JNWPs are of two general types: interim and permanent.

INTERIM CHANGES.—Interim changes are issued whenever necessary to add information to a publication. An interim change may be necessary to correct an error in the original publication, to specify a change in operational procedures or equipment, and so forth. It is normally distributed on a copy-for-copy basis to holders of the publication being changed. The interim change may be transmitted electrically, if justified, by necessity for speed; this is followed by the normal copy-for-copy distribution.

Interim changes are assigned a double number, such as 1-1, 1-2, 1-3, 2-1. The first digit signifies the permanent change that will supersede the interim change. The second digit signifies the number of the interim change itself within the series. A permanent change will supersede all interim changes with a like-first digit. For example, if there were three interim changes prior to change 1, these would be numbered like the first three in the beginning of the paragraph.

An interim change transmitted by electrical means shall be numbered as an interim change. It is associated with the numbered interim change by the following wording:

"This message pertains to SWOP ________ dated ________ and contains advance interim change (number) information which is effective upon receipt of change ________ dated ________." Interim change documents will be retained in front of the applicable SWOP until superseded.

PERMANENT CHANGES.—Permanent changes are numbered consecutively and consist of replacement pages to the basic manual. A permanent change should include all of the interim changes with the same first number unless otherwise noted in the interim change. Using the previous numbers, changes 1-1, 1-2, and 1-3 would all be superseded by permanent change 1. Permanent change 1 would supply all of the replacement pages for these interim changes.

A new title page and list of effective pages are always issued with permanent changes.

REVISIONS.—A reissue of the entire publication under a new date is called a revision.

A revision to a publication includes all pages of the publication. New covers usually are not issued with revisions. Upon receipt of a revision, the covers would be removed from the superseded publication and installed on the effective publication.

Accountability for Publications

The Top Secret and Secret documents have a copy number marked on each one; and this number is entered on the record card for each such publication. Each publication copy must be accounted for and identified by its copy number. The administrative methods of recording and receipting for the material are originated by the person in command.

Allowance List

NOS McAlester is delegated the responsibility of controlling, stocking, and mailing NAVY SWOPs. Requirements for these publications are determined by NOS McAlester from the NAPSAC report. NAVY SWOP allowance lists preparation and revision are made by NOS McAlester, based on the NAPSAC, letter requests advanced planning information, and direction by the naval systems commands.

Periodically, the Navy SWOP allowance lists (IBM printed sheets) are forwarded to the activities on the distribution list for review. Allowance lists are also forwarded upon major revisions of the allowance and when requested by activities. Requests for establishment of or changes to an allowance list should be submitted to the commanding officer of NOS McAlester, via your command's type commander.

Ordering Publications

If an addition to the SWOP allowance list is required, a letter request must be submitted to NOS McAlester, stating justification for the new publication. Publications, in excess of allowance, should be disposed of by following OPNAVINST 5510.1.

Inventory

At regular intervals the publications' custodian must make an inventory of the publications on hand. This inventory helps to prevent loss of classified books, which require strict accountability. Classified publications should also be handled carefully. Personnel are responsible for and accountable for any classified publications loaned to them. At times, some of your personnel will need to have this fact impressed upon them.

Destruction of Publications

When a revision or permanent change to a classified document is received, the superseded pages must be destroyed. The procedures for destruction of classified documents are prescribed by OPNAVINST 5510.1, *Department of the Navy Information Security Program Regulation*. Classified material may be destroyed by burning, pulping, pulverizing, or shredding, provided destruction is complete and reconstruction is impossible. Care should be taken when classified matter is burned that it is completely consumed by the fire and that the remains give no indication of the original contents.

EMERGENCY DESTRUCTION.—Time is one of the most important factors in emergency destruction. To effectively destroy classified material during an emergency, certain preparations must be made in advance. Personnel must be trained in emergency procedures and in the proper use of demolition material. Emergency destruction of classified publications aboard ship while at sea may be accomplished by dumping them in deep water. All that is necessary, is to place the publications in weighted canvas bags and throw them overboard. These canvas bags should be kept in or near the classified containers at all times.

DESTRUCTION OF CLASSIFIED WEAPONS AND EQUIPMENT.—The destruction of classified weapons and equipment presents a different and more difficult task than destroying publications. The weapons department should have a well-organized destruction bill and an active training program to meet destruction requirements. The details for destruction of classified weapons and equipment are beyond the scope of this manual. Refer to NAVY SWOP 50-8 and the Army's Field Manual 5-25 for different methods of destruction and the use of different demolition materials. Type commanders will issue instructions concerning these types of emergency destructions.

REPORTS

The Naval Sea Systems Command requires certain reports to be submitted in order to collect and correlate the information with respect to improving the design, performance, and reliability of ordnance equipment. The efficiency of ordnance equipment has been improved by alterations to equipment and by replacement with improved new equipment. These alterations or new equipment have come about, to a certain extent, as a result of the reports submitted by personnel on the performance analysis of the equipment. All reports fall into one of three general categories—recurring reports, performance reports, and special reports.

Recurring Reports

Recurring reports are reports that are due periodically at a specified time. An example of this type of report is the gun wear/star gauge report required on all 3-inch to 16-inch guns in service.

An example of a nuclear weapons recurring report is the semiannual inventory report (SIR). The SIR reflects the total of the various reportable items on hand as of 1200 local time on specified dates. This report consists of a listing of war reserve major assemblies and specified service atomic ordnance items on hand as of the end of each semiannual period based on the physical inventory conducted. A SIR will be submitted on each specified date even if no changes occurred since the previous SIR. Details on submission of the SIR are classified Secret, R.D., and reporting instructions are found in JCS PUB 6, Vol. II.

Performance Reports

Performance reports are periodic reports, such as firing exercise reports, given to determine the operational performance level of each type of weapon and weapon system. The firing ship is responsible for report analysis and preparation. Except for firing reports, most ordnance performance and casualty reports are transmitted to maintenance related systems/programs. These systems/programs have the in-service engineering responsibilities and authority necessary to solve and correct problems concerning ordnance and associated equipment.

The Deficiency Corrective Action Program (DECAP) supports the weapons and equipment associated with gun mounts and guided missile launching systems. This program receives its input from the commanding officer narrative reports (CONARs), the 3-M Systems, and casualty reports (CASREPs). The DECAP provides periodic feedback status reports on the progress toward correcting maintenance problems and casualties to ordnance equipment.

The Torpedo Management Information System (TMIS) provides the same function for torpedoes as DECAP does for guns and guided missiles. The TMIS receives its input via NAVSEA form 8510.5. Instructions for completing the TMIS is provided in technical document TW510-AA-PRO-020/TMIS.

Special Reports

Special reports are reports of a single occurrence, such as a gunnery accident report, that are submitted by following OPNAVINST 5102.1.

Another example of a special report is the nuclear weapons status report (WSR). The WSR reflects new totals of reportable items on hand as of 2359 local time each day that a reportable change occurs. Only those items that have undergone a reportable change since submission of the previous WSR are reported. Reasons for submitting a WSR would be receipt of any reportable items, shipment of them, expenditure (whether planned or accidental), an alteration change, an item becoming nonoperational (RED), and so forth.

TECHNICAL PUBLICATIONS

The principal technical publications that the weapons officer is concerned with are those that are issued by the Navy Systems Commands. Other technical publications are issued in the form of manufacturers' handbooks; Army TMs, FMs, and so forth; and the Air Force TOs. The available publications are listed in NAVSUP Publications 2002, Navy Stock List of Forms and Publications, Cog. I.

The effectiveness of a modern, complex weapons system is influenced directly by the completeness, accuracy, clarity, and timeliness of applicable technical publications. It is necessary that such publications be recognized as of equal importance to the hardware they concern. Technical manuals may be defined as media for disseminating clear and effective instructions for the safe operation and maintenance of mechanisms or systems which may range from the relatively simple to the highly complex. These manuals are also the media for explaining what an item of weaponry is and what it is designed to do. They provide descriptions, detailed operating procedures, safety precautions, and procedures for checkout, preventive and corrective maintenance, and overhaul.

Technical Manual Identification Numbering System

The Navy is in the process of converting all OPs and ODs to the standard technical manual identification numbering system (TMINS). TMINS has been developed as a means of providing a unique numbering system for publications. The use of this single numbering system will eliminate the complications in the fleet that now result from the many varied numbering systems now in use. In addition, the system will aid the standardization of cataloging within the systems commands and will simplify the interfaces between technical manual data collections and technical manual information system. For a more detailed description and explanation of TMINS, refer to M0000-00-IDX-000/TMINS. As you have probably already noticed, there are thirteen characters in the first part of the standardized TM identification number for a TMINS book. This is the same quantity of characters as in the national stock number (NSN) for publications, such as 000-LP-000-0000. It is all that is required to identify a publication or document. The second part of the identification number is separated by a virgule (slash mark) and is a variable length suffix of up to seventeen characters. This suffix is added to provide security information and to provide user-oriented information, such as the applicable equipment designator or document identifier (as in /TMINS). Except when using classified documents, use of the suffix is not mandatory. As a weapons officer, you should keep in mind that all NAVSEA cognizance technical manuals are identified by the letter S, as in SW830-A0-MM1-060/SUBROC Mk 28. No further discussion will be made on TMINS at this time; for detailed information, refer to M0000-00-IDX-000/TMINS.

ORDNANCE ALTERATIONS.—Ordnance alterations (ORDALTs) prescribe specific authorized changes (as distinguished from repair and other maintenance work that does not alter the design or characteristics of the equipment) in specific ordnance equipment. Alterations of ordnance equipment are permitted only as authorized by ORDALTs, and they must be made strictly according to the drawings and instructions that form the ORDALTs.

Tactical Publications

The tactical publications are commonly known as Naval Warfare Publications (NWPs). NWP refers collectively to the several groups of publications that contain the tactical doctrine of the U.S. Navy. Specifically, the NWP series includes Naval Warfare Publications (NWPs), Naval Warfare Information Publications (NWIPs), Fleet Exercise Publications (FXPs), Allied Exercise Publications (AXPs), and certain Allied Tactical Publications (ATPs).

In general, the tactical doctrine publications are designed to present guidance in doctrine, tactics, procedures, and training exercises of the highest possible quality to ensure the effective combat use of U.S. Navy ships, aircraft, and weapons systems. Some of the publications, such as ATP 1(A), contain material that is of a directive type; therefore, strict compliance is a requirement. Other publications contain formats, methods, and checklists that are designed to effect standardization in procedure. Much of this material is informative rather than directive and is intended to provide background and guidance for the personnel who use them.

The NWP series is divided into four main groups.

- Group 1 deals with administrative procedures and covers such procedures as management and production of NWPs to medical and legal support.

- Group 2 deals with planning and supporting combat operations. This group covers strategic and operational planning through logistic and supporting operations.

- Group 3 covers combat operations and tactics. This group is the larger of the three groups. It covers mixed combat operations and tactics, airborne combat operations and tactics, and surface/subsurface combat operations and tactics.

- Group 4 is the fleet exercise programs and covers the FXPs. They are designed to provide a standard method of conduct for exercises, together with the means of evaluating their effectiveness.

REFERENCE LIST

Department of the Navy Directives Issuance System, SECNAVINST 5215.1C, Office of the Secretary of the Navy, Washington, D.C., April 1970.

Department of the Navy Directives Issuance System Consolidated Check List, NAVPUBINST 5215.3, Navy Publications and Printing Office, Washington, D.C., October 1983.

Department of the Navy Directives Issuance System Consolidated Subject Index, NAVPUBNOTE 5215.4, Navy Publications and Printing Office, Washington, D.C., April 1983.

Department of the Navy File Maintenance Procedures and Standard Subject Identification Codes (SSIC), SECNAVINST 5210.11C, Office of the Secretary of the Navy, Washington, D.C., August 1982.

Department of the Navy Information Security Program Regulation, OPNAVINST 5510.1F, Office of the Chief of Naval Operations, Washington, D.C., July 1981.

Manual of Navy Total Force Manpower, OPNAVINST 1000.16E, Office of the Chief of Naval Operations, Washington, D.C., March 1981.

Mishap Investigation Reporting, OPNAVINST 5102.1A, Office of the Chief of Naval Operations, Washington, D.C., April 1982.

National Search and Rescue Manual, NWP 37, Office of the Chief of Naval Operations, Washington, D.C., April 1983.

Nuclear Weapons Technical Inspections, OPNAVINST 5040.6E, Office of the Chief of Naval Operations, Washington, D.C., June 1975.

Ships' 3-M Manual, Volumes 1, 2, and 3, OPNAVINST 4790.4, Office of the Chief of Naval Operations, Washington, D.C., July 1980.

Standard Organization and Regulations of the U.S. Navy, OPNAVINST 3120.32A, Office of the Chief of Naval Operations, Washington, D.C., March 1979.

Standard Technical Manual Identification Numbering System (TMINS), M0000-00-IDX-000/TMINS, Headquarters Naval Material Command, Washington D.C., May 1980.

CHAPTER 3

TRAINING

In this chapter, you will become familiar with the procedures and techniques used in training personnel, and the formal training that is available for training purposes.

Maintaining an efficient organization requires formalized education and training programs to meet future needs for trained personnel in both the active and inactive forces of the Navy. The extent of the training mission of the Navy depends upon future qualitative and quantitative requirements. It is a problem of comparing current onboard skills with future requirements and providing the education and training necessary to compensate for prospective losses in each of the many specialities.

The immediate objective of training is to enhance the knowledge and practical abilities so personnel can better perform their duties. Continuing manpower shortages, rapid turnover of personnel, and the already heavy demands placed on the time of shipboard personnel are recognized obstacles that must be overcome in establishing and managing a successful shipboard training program. In the absence of a vigorous and continuing shipboard training program, sustained combat readiness is impossible.

GENERAL TRAINING

To carry out the Navy's mission, modern naval warships and aircraft are equipped with elaborate devices for detecting, engaging, and destroying the enemy. To reach their designed effectiveness, these complex machines must be manned by highly trained personnel. The ultimate purpose of naval training is to educate and train the Navy's personnel in a manner that will ensure efficient employment of modern naval material and principles. The education and training program of the Navy rests upon foundations that have evolved through years of naval experience.

The basis of all training is the development of skills in the individual. The individual is trained to fill successfully the assigned billet aboard ship and to prepare for both advancement in rating and for more responsibilities. Group training, or training of a ship as a whole, can only be accomplished with a successful individual training program as a base.

The weapons officer has the responsibility of training all personnel in certain basic training categories; in addition to this, he assures that the personnel in the department are trained in all categories. A portion of this training should be performed as a part of the orientation and indoctrination of all new personnel reporting aboard. Other parts may be accomplished by on-the-job training. However, some subjects lend themselves only to formal lectures. This chapter will help you to better understand the process and goals of a sound training program.

SAFETY TRAINING

In the study of safety precautions, it is difficult to cover every possible situation that may arise and which, if improperly handled, may produce serious danger areas. However, if a thorough understanding of the basic ideas behind the precautions is developed, unsafe conditions can be recognized and corrected and, further, suitable action can be taken instinctively when the unexpected occurs.

Proper training of personnel is the keystone to a successful safety program. By becoming completely familiar with the requirements in the major areas of personal conduct, regulations and procedures, and condition of equipment, responsible persons are best prepared to avoid the actions that most commonly lead to accidents. Training sessions should include reading two important OPs on safety: OP 1014, *Ordnance Safety Precautions*, and OP 3347, *United States Ordnance Safety Precautions*.

Adherence to safe operating practices and procedures can be obtained only when a clear and practical understanding of accident prevention has been instilled in the minds of all personnel. This goal of thinking is only obtained when an efficient, adequate, and continuous safety training program is maintained. The program must be supported by strict discipline designed to enforce the continued observance of all safety practices.

Safety is everyone's responsibility. Awareness of danger, knowledge of how danger can be avoided, and constant vigilance are the three basic requirements to prevent accidents. The foregoing factors should be incorporated into every safety program.

It is absolutely essential that an individual's training in safety is equal to the development of his technical skills. With the increasing complexity of equipment that personnel work with, each individual must exhibit an attitude of "safety-mindedness" to avoid personnel injuries and to prevent damage to equipment that may be vital to the ship's fighting effectiveness. Safety should become an integral part of the working habits of every person on board.

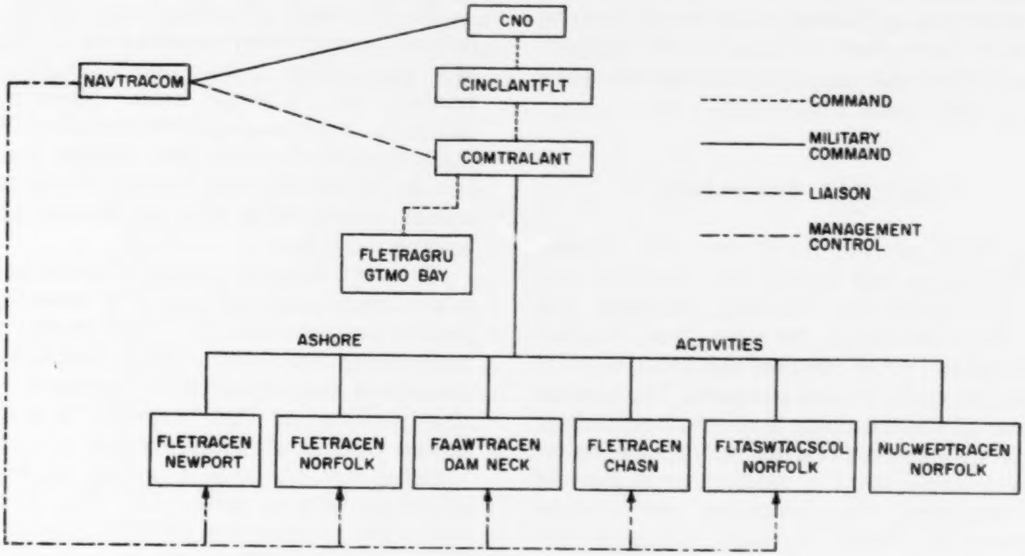
When you are setting up a safety training program, place strong emphasis on safety at the beginning, during, and after the training. A follow-up program should be established as part of a continuing overall safety program.

THE NAVY TRAINING PROGRAM

Article 0304 of *U.S. Navy Regulations, 1973* outlines the primary duties of the Chief of Naval Operations (CNO). The article states in part that the Chief of Naval Operations commands the operating forces of the Navy and is responsible to the Secretary of the Navy for the administration and use of these forces, including, but not limited to, their training, readiness, and preparation for war, and plans therefor. CNO has delegated some responsibility for training to the systems commands, bureaus, and offices and has established the Deputy Chief of Naval Operations (manpower, personnel, and training) as the OPNAV focal point for surface/subsurface training. Likewise, the Commandant of the Marine Corps is responsible for all training of the Marines.

Originally, the Chief of Naval Personnel was responsible for all education and training of regular and reserve personnel as individuals, except for the professional training of medical and aviation personnel.

In a major reorganization of the Navy's training structure, the Chief of Naval Operations established (effective August 1971) the Naval Education and Training Command (NAVEDTRACOM, with headquarters at Pensacola, Florida), headed by the Chief of Naval Education



63.6

Figure 3-1.—Training Command, U.S. Atlantic Fleet.

and Training (CNET). NAVEDTRACOM has two subordinate commands as follows:

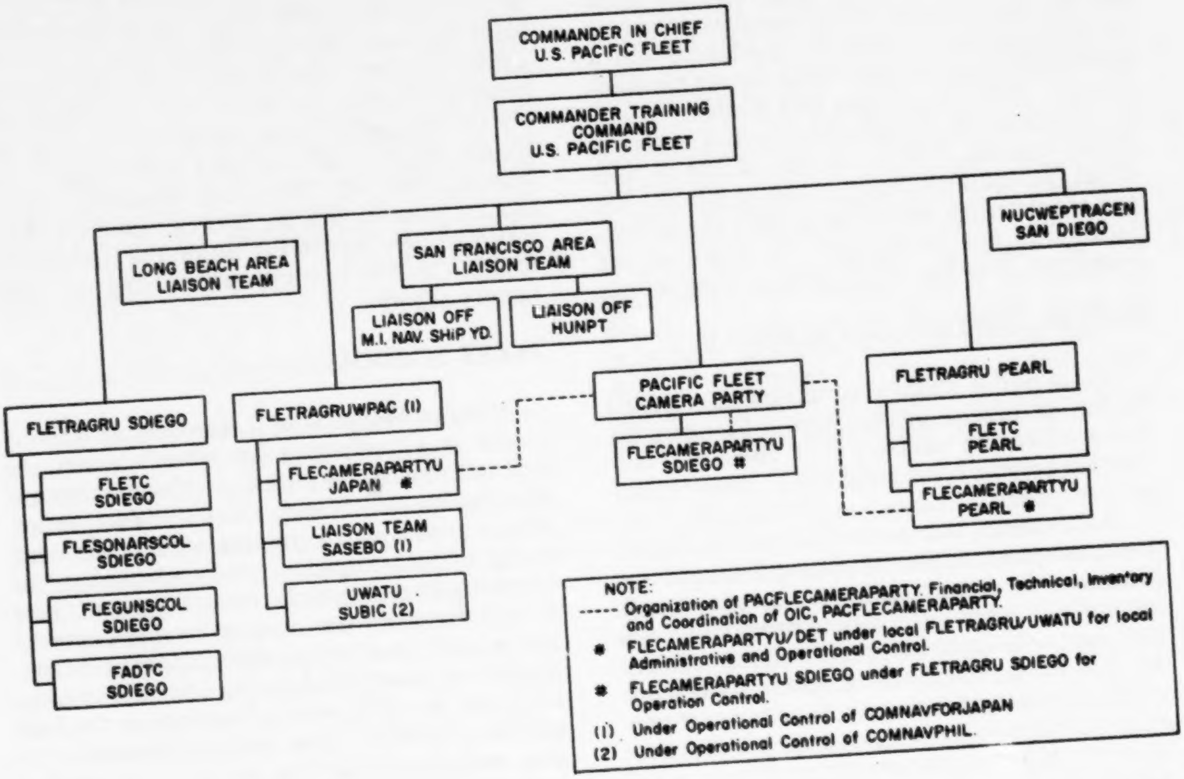
- The Chief of Naval Air Training, at Corpus Christi, Texas
- The Chief of Naval Technical Training, at Memphis, Tennessee

Most of the functions previously performed under the Assistant Chief of Naval Personnel for Education and Training (Pers-C) were transferred to Pensacola and Memphis.

The management of officer specialized training and officer candidate training were moved to Memphis and Pensacola. Management of education programs such as the NROTC and the Naval Academy remained as a staff function in Washington. Other DOD programs managed by the Navy, overseas dependent schools, and similar programs also remained in Washington.

Materials for Naval Reserve training, formerly prepared in the system operated by the Chief of Naval Personnel, are now prepared under the direction of the CNET.

The CNET is responsible for basic and technical training of individual personnel. The Deputy Chief of Naval Operations (OP-01) is responsible for all operational training of a ship or its personnel as a unit of a ship's company. OP-01 exercises this training responsibility through the Commander-in-Chief, Atlantic Fleet, and the Commander-in-Chief, Pacific Fleet, who in turn exercise their respective task, fleet, and type commanders. The Commander, Training Command, in each fleet is responsible for a considerable part of the basic operational training of ships. As directed by the fleet commanders, this command assists the type commanders and the task force commanders in the conduct of training and provides training facilities, such as the fleet training groups and centers, which will be described in more detail later. (See figures 3-1 and 3-2.)


COMMANDER IN CHIEF
U.S. PACIFIC FLEET
COMMANDER TRAINING COMMAND
U.S. PACIFIC FLEET
NUCWEPTRACEN
SAN DIEGO
LONG BEACH AREA
LIAISON TEAM
SAN FRANCISCO AREA
LIAISON TEAM
LIAISON OFF
M.I. NAV. SHIP YD.
LIAISON OFF
HUNPT
PACIFIC FLEET
CAMERA PARTY
FLETRAGRU PEARL
FLETRAGRU SDIEGO
FLETRAGRUWPAC (1)
FLECAMERAPARTYU
SDIEGO #
FLETC
PEARL
FLECAMERAPARTYU
JAPAN *
FLECAMERAPARTYU
PEARL *
FLETC
SDIEGO
LIAISON TEAM
SASEBO (1)
FLESONARSCOL
SDIEGO
UWATU
SUBIC (2)
FLEGUNSCOL
SDIEGO
FADTC
SDIEGO

NOTE:

----- Organization of PACFLECAMERAPARTY. Financial, Technical, Inventory and Coordination of OIC, PACFLECAMERAPARTY.

* FLECAMERAPARTYU/DET under local FLETRAGRU/UWATU for local Administrative and Operational Control.

# FLECAMERAPARTYU SDIEGO under FLETRAGRU SDIEGO for Operation Control.

(1) Under Operational Control of COMNAVFORJAPAN

(2) Under Operational Control of COMNAVPHIL.

63.7

Figure 3-2.—Training Command, U.S. Pacific Fleet.

The training cycle for each ship corresponds to that period between regularly scheduled shipyard overhauls. The most important feature of the training cycle is that it furnishes a basis for scheduling inspections and trials. The intratype competitive period corresponds to the fiscal year regardless of the training cycle in the Atlantic Fleet. Fleet operating schedules are issued on both a quarterly and annual basis and govern many factors that must be taken into consideration in the planning of maintenance and training.

TRAINING FACILITIES

The schools that were formerly controlled by the Bureau of Naval Personnel are now administered by the Chief of Naval Technical Training under the direction of the Chief of Naval Education and Training Command.

The primary objective of the Navy's enlisted school training program is to develop individuals so they may become skilled in the technical requirements of their ratings and the awareness of their responsibilities as leaders in the naval service. This training may be aided by providing an opportunity, a stimulus, guidance, and a challenging environment that promote the complete development of men and women.

The first step towards the objective occurs in recruit training. During this period, the recruits effect the transition from civilian to military life and are classified according to their educational capabilities and background to determine the vocational field for which they are best suited.

BUPERS CONTROLLED SCHOOLS

From recruit training recruits may be selected for further training or transferred to the operating forces where they can learn more about the Navy and thus exercise better judgment in planning their service career.

Some ratings, such as Fire Control Technician, are so complex that formal training is mandatory. If selected for such a rating, the person attends a class "A" school; this school provides formal training in the technical qualifications required for the lower petty officer rates. Later, this person may attend a class "C" school that provides formal training in a particular job qualification or skill, not necessarily required in the rating.

In addition to the two classes of school mentioned above, the Naval Technical Training Command exercises command and support of class "P" schools and several functional schools. Class "P" schools provide training at a basic or preparatory level for personnel assigned to a broad occupational field. In peacetime there are few such schools. In times of emergency, however, when training as rapidly as possible in certain fundamentals is necessary, additional schools at the class "P" level are established. Functional schools provide instruction in specialized functions not normally included in rating training of enlisted personnel or in postgraduate or technical courses for officers. Examples of functional schools include the schools for mine warfare, explosive ordnance disposal, and the nuclear power training units. A complete listing of those schools currently in operation may be found in the *Formal Schools Catalog*, NAVPERS 91769.

FACTORY SCHOOLS

Some of the manufacturers of equipment used by the Navy maintain factory schools for training in equipment maintenance and repair. When the fleet receives a new type of equipment, Navy personnel are sometimes sent to factory schools until the Navy has time to establish its own training program. At the factory, personnel can see the equipment being assembled and can be trained in its operation and maintenance. At present, relatively few Navy personnel attend factory schools. But the fleet can expect a great influx of new equipment within the foreseeable future. This may result in an increasing use of the factory schools.

FLEET SCHOOLS

Prior to World War II, the bulk of training ashore was performed by schools under the management of the Bureau of Naval Personnel (then the Bureau of Navigation). However, to provide a maximum of training with a minimum outlay of fuel, torpedoes, and ammunition, the operating forces opened several shore-based fleet schools during the war. Among the first successful fleet schools were the antiaircraft training centers. These were established during the early months of World War II at several locations on the East and West Coasts. These schools furnished the guns and ammunition that permitted actual day and night firing ashore. This practice provided an opportunity for gun crews to gain much needed gunnery experience without the expenditure of scarce and costly fuel to propel ships to and from safe firing areas. As the war progressed, schools for training in numerous shipboard functions, such as damage control, fire fighting, CIC, ASW, telephone usage, and lookout and recognition, were organized into activities that came to be called fleet training centers.

Fleet Training Center

Today, the fleet training centers are organized for group and individual operational training ashore. Here are collected the equipment, the aids, and the facilities that experience has shown make possible the most rapid and effective training of teams and crews. To meet the needs of the fleet, courses are planned to both instruct individuals and to assemble them into teams. A typical fleet training center might include the following schools: CIC, communications, ASW, seamanship and navigation, gunnery and torpedo, damage control (including fire fighting), engineering, and numerous minor schools for training individuals in their shipboard duties. Of particular interest are the team training courses for director and mount crews. These courses are designed as a substitute for the months of shipboard operational experience required to develop a competent combat team. All team members are equally trained in the various duties assigned to the team, thereby permitting maximum flexibility of individual battle station assignments. Generally, fleet school courses are shorter than those of "A" and "C" schools to minimize potential drain on fleet manpower needed for operations.

Fleet Combat Training Centers

The fleet combat training centers have combined both the functions of the World War II antiaircraft training centers and the CIC team training centers. Their purpose is to integrate the functions of target location, target designation, target acquisition, gun fire control, missile guidance, and aircraft interception. These centers are equipped with most of the current types of antiaircraft ordnance equipments, radars and other detection equipments, information display devices, target simulation equipment, and communication and designation units required for training. The fleet combat training centers serve to foster AAW training and to aid in the development of new defense techniques, particularly in the integration of the air detection and destruction missions. Standard CIC training facilities are also provided at fleet training centers, but on a much less elaborate basis.

Sonar Schools

The fleet sonar schools are training establishments of many years standing. They provide training in the operation and maintenance of sonar and interface fire control equipment. Additionally, the schools are equipped to train ASW officers. The schools are equipped with most types of sonar equipment, attack teachers, antisubmarine attack control equipment, and some CIC equipment. To a lesser extent, ASW attack teachers and other ASW training are provided by the fleet training centers and tenders. But the major part of basic ASW training is conducted at the fleet sonar school and the fleet ASW school at San Diego.

Safety School

In addition to the schools previously mentioned, many other schools are available for training in technical and occupational fields. One such school is a safety school managed by NAVSEASYSCOM. The NAVSEASYSCOM safety school was founded in 1967 to meet the expanding need for all forms of safety training. This includes training in industrial hazard control, fire protection, hazard control management, and occupational health and hygiene. The school is affiliated with Indiana University so that qualified students may take courses for university credit. A wide variety of specific areas of training is available with the courses that are primarily designed for Navy Department personnel including shore, surface ships, submarine, aviation, and Marine Corps personnel.

Shore Bombardment Courses

The basic principles of shore bombardment are usually taught at the fleet combat training centers. The practical application of these principles—the function of your ship's CIC, navigation, and plotting room teams—is usually taught at the combat training center. These courses are designed to perfect individual skills in computer setup, spotting, navigation, CIC procedures, and communications. Because these courses are of great value in shaping up the team, they should be used at every opportunity.

Shakedown and Refresher Training

Shakedown and refresher training is designed to provide the broadest basic team training within a prescribed time period. The mission of the fleet training groups is to provide intraship training to aid commanding officers in developing team work in all operational aspects of ship evolutions necessary for safe and efficient performance of basic missions. The fleet training group commander will conduct shakedown and refresher training using the standard training requirements prescribed by the appropriate COMTRALANT/COMTRAPAC instructions.

Weapons exercises during shakedown and refresher training will be conducted according to FXP-2, FXP-3, instructions issued by the training group, and other appropriate directives.

It is generally assumed that a minimum state of training must be attained by the crew prior to the commencement of the shakedown or refresher period. It is emphasized that shakedown or refresher training is essentially operational team training. Individual and operator training, as well as basic team training accomplished on actual or simulated equipments, must be completed to furnish members of the weapons team with the necessary skills to operate the weapons system. The mission of the weapons aspect of refresher or shakedown training is to aid the commanding officer in developing an efficient team with the compatibility of accurately using all installed surface-to-surface or surface-to-air weapons systems.

In addition to prerequisites in training, a certain level of material readiness must be reached prior to the commencement of refresher or shakedown training. All ordnance equipment must be in operating condition with a full allowance of spare parts on board. The ammunition load must include a full allowance of training ammunition. A complete battery alignment including alignment of target designation systems and search radar must be accomplished. If the ship has recently left the shipyard or is newly commissioned, all installed weapons must have been fired either in part of an exercise or in burst practice prior to either refresher or shakedown training.

Shakedown training is provided for a ship and crew when the ship has acquired a substantially new crew. Since the major changes in a crew are made while the ship is in a shipyard, shakedown training of this nature usually occurs when the ship leaves the shipyard.

Refresher training is a formal underway training period for ships following a major shipyard overhaul or a repair period; it is devoted to training the ship and crew as necessary to reach an acceptable state of combat readiness. Refresher training is similar to shakedown training in content but of shorter duration. Both shakedown and refresher training are conducted according to standard requirements established by the cognizant type commander. Refresher training can be broken down into three areas as follows:

- MODIFIED REFRESHER TRAINING.—A fleet training activity provides this type of training for a ship and crew when the time limitations preclude the scheduling of normal refresher training. This training is provided in all areas through applicable standard training requirements for ship type, but fewer exercises are conducted than in a normal refresher training period.

- SELECTIVE REFRESHER TRAINING.—This type of training is provided by a fleet training activity for a ship and crew when a specific request for training assistance for the ship is desired by the type commander during any period other than shakedown, refresher, or modified refresher training. The training may cover broad or specific areas, specific standard training requirements, or exercises. This training may be considered comparable to type training independent ship exercises and may be conducted for any period of time.

- INTERIM REFRESHER TRAINING.—This type of training is provided by a fleet training group for a ship and crew when the ship is readying for deployment and it is considered by the type commander that additional underway training would prove beneficial. This training is designed to peak up the ship's general quarters teams. It normally consists of two battle problems and a reduced standard training requirement as directed by the type commander. The training is closely allied to refresher, shakedown, underway training and underway training assistance.

SHIPBOARD TRAINING FACILITIES

The bulk of Navy enlisted personnel training must be conducted on board ship. Therefore, it is important that maximum use be made of available shipboard facilities. One advantage of shipboard training facilities is availability of the actual equipment in the shipboard environment. The most logical place to train a person in the operation of equipment is at the equipment itself. Whenever this is impossible because of noise, inaccessibility, or other reasons, the next best training situation must be used—a space rigged as a classroom. This necessitates the use of various training aids, which may or may not be available. The training program should include a provision for the procurement, storage, maintenance, and issue of training material. This may include motion pictures and projectors, slide films, opaque projectors, texts, charts, and so forth. Evaluation and training support centers and sections are maintained at Naval Education and Training Support Centers (NETSCN) located at San Diego and Norfolk from which the various training aids may be drawn for use aboard ship.

ON-THE-JOB TRAINING

On-the-job instruction should be given during drills, routine evolutions, and watches until all individuals in the watch section can perform all the duties expected of them, and each member of a team can do his/her part in the functioning of that unit. Principles, theories, and other related knowledge can be taught later in a classroom atmosphere. Every effort must be made to extract maximum training from every watch, drill, and evolution. The petty officer in charge of a watch section or special detail must know in advance what phase of the training is going to be covered during any watch or drill. Close and constant supervision and coordination are necessary so training may be done properly and continuously.

Except for all hands drills and evolutions, there will be sections of the crew that can be scheduled for classroom work during operations and special drills. The division officer should properly use this time. Foul weather will affect scheduling, and classroom activities may have to be expanded, but under no circumstances should informational training be allowed to be substituted entirely for practical work. On-the-job training that is interrupted by the weather should only be delayed—not cancelled.

INSTRUCTORS

Every officer and petty officer must take an active part in the training program and is expected to be a qualified instructor for three important reasons. First, the immediate supervisor of a group or team is its logical instructor. Second, many occasions will arise when more urgent duties will prevent officers from carrying out their instructor assignments. Third, there is no better method for petty officer (or officers) to attain definite positions as leaders than by acting as instructors in a competent manner.

An instructor should be capable in the specialty being taught and have a potential teaching ability that can be developed through instructor training and experience. Also, this individual should have sufficient prestige or authority to maintain discipline.

TRAINING MANUALS AND CORRESPONDENCE COURSES

In addition to supervised group training, training manuals and correspondence courses provide several opportunities for individual training aboard ship. An individual's usefulness to the Navy is increased by improving one's knowledge in all areas of academic subjects.

Navy training courses are written to provide officer and enlisted personnel with the information they need to perform the duties of their particular field or rating and also to prepare them for advancement. Navy training courses are self-study courses that may be supplemented by individual or group instruction. The value of these courses can be greatly enhanced if their use is closely aligned with practical shipboard training. A comprehensive list of training manuals, correspondence courses, and Personnel Qualification Standards (PQSs) can be found in NAVEDTRA 10061. A copy of this information booklet can be obtained from the educational service offices of any command.

SURFACE MISSILE SHIPS (SMSs) AUDIOVISUAL PROGRAMS

Audiovisual programs have been produced for shipboard training of personnel aboard SMSs. These programs and the associated audiovisual equipment are used by every class on SMSs. The program used by each class of ship has been developed specifically for the type of missile carried and the mark and mod of missile equipment installed aboard that class. These programs have also been distributed to various fleet training centers, type commands, and other activities directly involved in SMS operations.

Each program includes a film strip or slide set, a tape-recorded lecture, and a manual. The manual provides a description of the program, frame by frame, and illustrations of the frames themselves. Various parts of a program may be classified Confidential or Secret.

One example of these programs is the ECM/ECCM Shipboard Training Program, Equipment Counter-Countermeasures AN/SPG-55B Unit 3. This program discusses the operation of the designated equipment in an ECM environment. The illustrations in the manual are duplicates of the film frames and serve to illustrate the salient points of the taped lecture. Programs, such as these, are available for other systems; that is, gun, torpedo, and so forth. They are a valuable contribution to any training effort.

SHIPBOARD ORGANIZATION FOR TRAINING

Close attention must be given to the training potentialities of the individual ship and to the elimination of all but essential paperwork in the program. Training methods will vary from ship to ship, depending on the size, design, and personnel allowance. Each ship's training time must be carefully balanced with the time allotted for maintenance. The proper time apportionment must be made by officers who KNOW existing shipboard training and maintenance conditions. Once a balance is established, programs for training and for maintenance should be carefully planned, executed, and controlled. The executive officer exercises overall supervision of the training program under the direction of the commanding officer. The XO may or may not have sufficient officer personnel aboard to designate one or more assistants. In larger ships, it may be possible to name an officer whose primary duty is to assist the executive officer in education and training. In smaller ships, the duties may be apportioned among the officers present as collateral duty, or the executive officer may elect to do them.

PLANNING BOARD FOR TRAINING

A board comprised of the executive officer as chairman, heads of departments, and the training officer is normally designated as the planning board for training. This board performs the following general functions.

1. Assists the commanding officer in formulation of training policies.

2. Establishes the training program for the ship and reviews the schedules within the program periodically to evaluate training progress.

3. Establishes one training syllabus for officers and one for enlisted personnel.

The planning board meets periodically after the training program begins to function to evaluate progress, coordinate action, and propose changes as necessary. The personal knowledge of members, the reports of the educational officer, and the various control devices used will all indicate points at which action should be taken to improve coordination. As an example of this, the operations department may be planning a series of lectures and presentations on the proper usage of sound-powered telephones for operations personnel. Since operations personnel require some knowledge of standard gunnery commands, coverage of these could be included in a joint training program with weapons personnel.

Progress is the only true measure of the training program's efficiency and effectiveness. To state simply that a certain amount of training has been done means nothing. Perhaps more should have been done. On the other hand, it is possible for extenuating circumstances to arise that will limit the training to what would appear to the casual observer to be far below the expected minimum.

Although the original program is designed with utmost care, the need for change will be caused by a number of variables. Following are some items that should be examined periodically for their possible effect on the training program.

1. Change in nature or schedule of operation

2. New or improved equipment

3. Change in the technical knowledge or skill required for performance of duty in any rating

4. Change in personnel

5. Change in regulations or procedures under which the ship is operating

6. Completion of any phase of the training program

7. Unforeseen obstacles to coordination or completion of the program

8. Increasing or decreasing facilities and availability of fleet and shore-based training establishments.

You can see from the above discussion that the responsibility of the planning board does not end with issuance of the training schedules. Every exercise or training program must be formally reviewed by the planning board. Division officers and petty officers should daily review and evaluate the effectiveness of the training program so the necessary data will be available to the board members for evaluation.

TRAINING SCHEDULES

Scheduling of shipboard training requires the careful attention of the training officer, department heads, and division officers to minimize conflict in the ship's activities. This ensures that the time allotted to training is used to the best advantage. You will have to schedule maintenance and upkeep carefully to avoid interfering with training. As an example, wholesale painting of weather decks should be delayed until after scheduled general drills so the passageways will be clear of obstructions. Paint chipping in the vicinity of classroom areas should also be held in abeyance whenever training is in progress. Routine overhaul of ordnance equipment that requires partial disassembly should not be scheduled just before gunnery drills. The only justification for a record of training is that it indicates to those responsible for training how much has been accomplished and how much remains to be done. Where possible, the same forms used to schedule planned training should be used to record completed training.

Records and schedules can be prepared and maintained on seven Navy standard forms which provide considerable flexibility. These are:

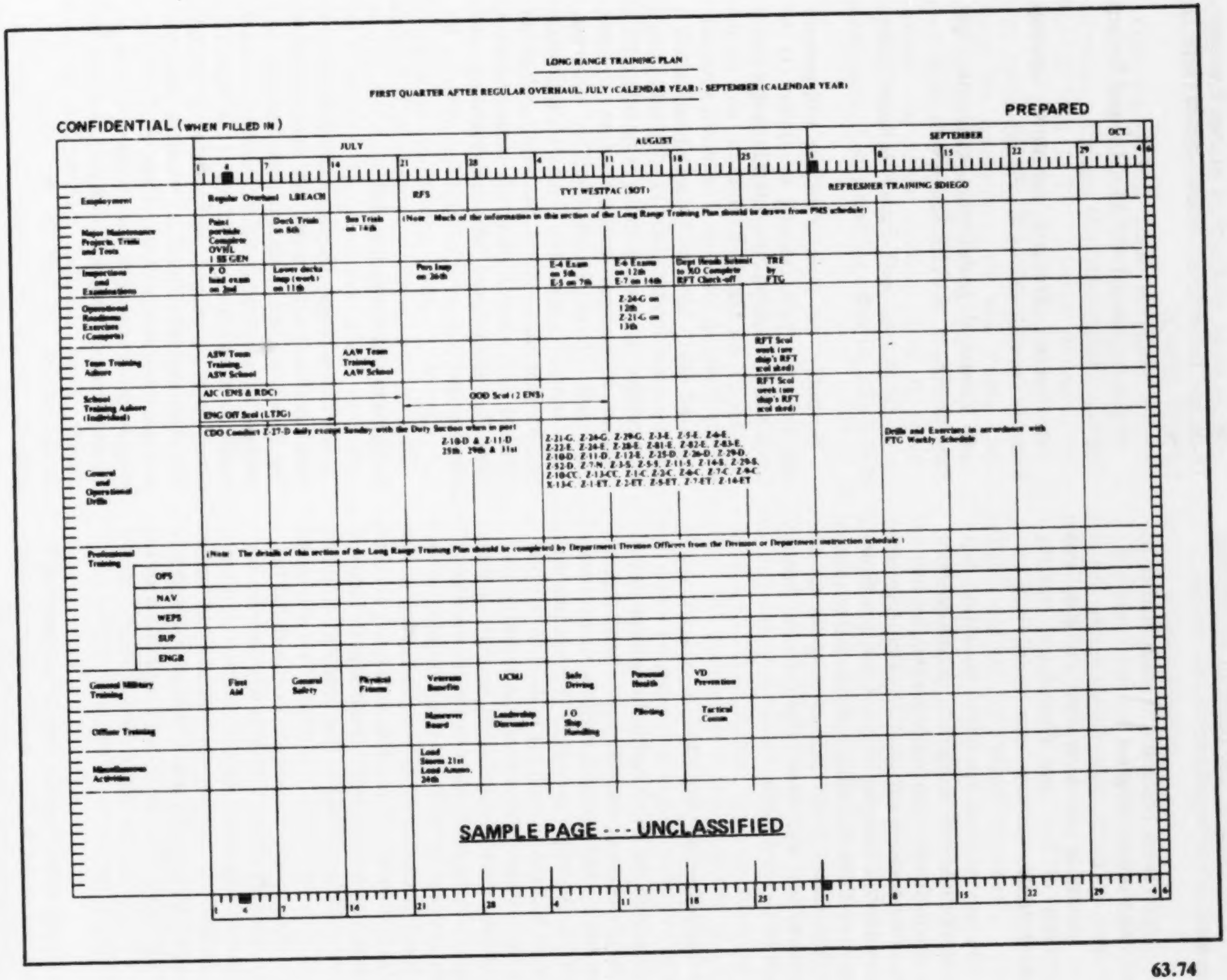
- Long Range/Quarterly Plan, OPNAV 3120/1A
- Monthly training plan, locally prepared
- TYCOM Required Training Exercises, Trials, and Inspections, General Record (Type 1), OPNAV 1500/30
- Group Record of PARs, General Record (Type 2), OPNAV 1500/31
- Division Training Schedule, General Record (Type 3), OPNAV 1500/32
- Personnel Qualification Standards (PQS) Progress Chart, NAVEDTRA Form 1500/1
- Division Officers' Personnel Record Form, NAVPERS 1070/6

Normally, the training officer will prepare and maintain three training schedules: (1) the Long-Range Training Schedule, (2) the Quarterly Forecast of All Hands Evolutions, and (3) the Weekly Training Schedule. The training requirements set forth by the type commander are a primary consideration of the planning board in establishing these training schedules. Ship exercises often require the services of other ships and aircraft or of qualified observers from another command. This is particularly true of weapons exercises. Naturally, whenever external assistance is required, more emphasis must be placed on advance planning and scheduling.

Long-Range Training Schedule

The long-range training schedule is the basic instrument for planning and recording the plans for all training and is used for keeping all personnel informed of projected training aims and operating schedules. It should contain enough information to ensure that the overall coordination and planning of training effort will be effective. It should provide the framework for the preparation of the quarterly and monthly training plans which contain more detailed information. Minor details which, if left in the plan, might tend to detract or obscure its broad outlines, should be eliminated.

The plan should be prepared on OPNAV Form 3120/1A, and it should cover the



LONG RANGE TRAINING PLAN

FIRST QUARTER AFTER REGULAR OVERHAUL, JULY (CALENDAR YEAR) - SEPTEMBER (CALENDAR YEAR)

PREPARED

CONFIDENTIAL (WHEN FILLED IN)

	JULY					AUGUST				SEPTEMBER				OCT
	1	7	14	21	28	4	11	18	25	1	8	15	22	29
Employment	Regular Overhaul LBEACH			RFS		TYT WESTPAC (SOT)				REFRESHER TRAINING SDIEGO				
Major Maintenance Projects, Trials and Tests	Paint portside Complete OVHL 1 SS GEN	Dock Trials on 8th	Sea Trials on 14th	(Note Much of the information in this section of the Long Range Training Plan should be drawn from PMS schedule)										
Inspections and Examinations	P O lead exam on 2nd	Lower decks insp (work) on 11th		Pers Insp on 26th		E-4 Exam on 5th E-5 on 7th	E-6 Exam on 12th E-7 on 14th	Dept Heads Submit to XO Complete RFT Check-off	TRE by FTG					
Operational Readiness Exercises (Competn)							Z-24-G on 12th Z-21-G on 13th							
Team Training Ashore	ASW Team Training, ASW School		AAW Team Training AAW School						RFT Scol week (see ship's RFT scol sked)					
School Training Ashore (Individual)	AJC (ENS & RDC) ENG Off Scol (LTJG)			OOD Scol (2 ENS)					RFT Scol week (see ship's RFT scol sked)					
General and Operational Drills	CDO Conduct Z-27-D daily except Sunday with the Duty Section when in port			Z-10-D & Z-11-D 25th, 29th & 31st		Z-21-G, Z-24-G, Z-29-G, Z-3-E, Z-5-E, Z-6-E, Z-22-E, Z-24-E, Z-28-E, Z-81-E, Z-82-E, Z-83-E, Z-10-D, Z-11-D, Z-12-E, Z-25-D, Z-26-D, Z-29-D, Z-52-D, Z-7-N, Z-3-S, Z-5-S, Z-11-S, Z-14-S, Z-29-S, Z-10-CC, Z-13-CC, Z-1-C, Z-2-C, Z-6-C, Z-7-C, Z-9-C, X-13-C, Z-1-ET, Z-2-ET, Z-5-ET, Z-7-ET, Z-14-ET					Drills and Exercises in accordance with FTG Weekly Schedule			
Professional Training	(Note: The details of this section of the Long Range Training Plan should be completed by Department Division Officers from the Division or Department instruction schedule.)													
OPS														
NAV														
WEPS														
SUP														
ENGR														
General Military Training	First Aid	General Safety	Physical Fitness	Veterans Benefits	UCMJ	Safe Driving	Personal Health	VD Prevention						
Officer Training				Maneuver Board	Leadership Discussion	J O Ship Handling	Piloting	Tactical Comm						
Miscellaneous Activities				Load Stores 21st Load Ammo. 24th										

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Figure 3-3.—Long-Range Training Schedule.

competitive training cycle (see figure 3-3). The main preparation considerations should be as follows:

1. Training During Overhaul. For most ships, the overhaul period provides an opportunity for sending personnel to schools. However, shipyard overhaul periods are characterized by heavy work loads of repairs, tests, fire watches, and supervision of shipyard work. On-the-job training, in-port fire drills, self-study courses, and drills by ratings must also be pursued during this period.

2. Training During Leave/Upkeep Periods Following Deployment. Training during this period is usually limited to formal school attendance and onboard damage control drills.

3. Coordinating Training and Maintenance. Generally speaking, the available work hours must be allotted according to the requirements of maintenance and training. Accordingly, the plans for accomplishing major maintenance should be shown.

The long-range training schedule should be prioritized in events as follows:

1. Schedule fleet exercises, trials, inspections, and other major evolutions required by type or fleet commanders.

2. Schedule all required exercises in kind and frequency required by the type commander to maintain C1 readiness.

3. Schedule other applicable unit exercises.

4. Schedule all unit training (for example, DC/NBC lectures, counterinsurgency, security orientation and training, boat crew training, telephone talker/lookout training, General Military Training (GMT), and so forth).

Quarterly Training Schedule

The quarterly training schedule is an integral part of the long-range training schedule. It consists of one sheet of the long-range training schedule that is updated to reflect the latest information or unit employment, and sets forth, in significant detail, the training intentions for a given quarter.

The quarterly training schedule may be prepared by filling in the details of the subsequent quarter of the long-range training schedule.

Monthly Training Schedule

This plan contains a daily schedule of the training, evolutions, and operations for a given month.

The plan is prepared by the training board and shows all unit training, evolutions, and operations previously scheduled in the quarterly schedule. Figure 3-4 is an example of the monthly training schedule.

Frequently, the information contained in the quarterly and monthly training plans is classified and should be so guarded. Secret or higher classified information should not be disclosed on either plan. If the highest classification of the operational information to be shown on the plan is Confidential, its protection and disclosure should not present security problems that would preclude the crew from being kept well informed.

Division Training Schedule

Each division officer should keep a record of all operational drills, team training periods, and instructional periods. The division training schedule may also be used to schedule supervised self-study of advancement in-rate training or correspondence courses.

The schedule may be recorded on both sides of OPNAV Form 1500/32. Each sheet can cover a period of one year. Because of space limitations, entries on the front side are abbreviated or coded (see figure 3-5). The reverse side of this form is designed for entering information, instructions, or remarks to supplement information on the front side. Also listed on the reverse side of this form are the various drills, exercises, and instructional periods that apply to each division concerned. Abbreviations and serial numbers are used to supply short drill numbers for use on the quarterly and monthly schedule, for example, SM7 (flashing light drill), and RD10 (radar tracking drill). Should there be several ratings or groups in a division, a separate schedule can be prepared to cover their respective training, for example, ST, TM, and GMG. Certain drills are frequently repeated many times for the benefit of watch standers. However, drills of this nature do not have to be formally scheduled.

INTERDEPARTMENTAL RESPONSIBILITY FOR TRAINING

In shipwide and interdepartmental exercises, officers and petty officers should be aware not

JULY MONTHLY TRAINING PLAN 1973

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
OPPORTUNE Z-26-S (R) Z-28-S (O) Z-29-S Z-13-CC	1 G. Q. Z-10-D NBC Lecture Intelligence Briefing UNREP 3 DER	2 DIVISIONAL SCHOOL J. O. School Cryto Drill UNREP: 2 MSO	3 DIVISIONAL SCHOOL J. O. School INREP: An Thoi	4 Hand grenade & small arms training all day for Deck and Ops	5 Field Day	6 G. Q. Battle Prob Z-6-D Z-11-S (R) Z-10-D Z-14-S Z-24-D Z-27-D Z-52-D Z-111-E (R)
7 Arrive Subic Z-27-D	8 Z-20-C (O) Z-27-D (Sec I)	9 GMT III DIVISIONAL SCHOOL J. O. School Crypto Drill Z-27-D (Sec II)	10 GMT III DIVISIONAL SCHOOL J. O. School Z-27-D (Sec III)	11 Lookouts lecture (Steaming Watches) Z-27-D (Sec I) PAY DAY	12 0500 Depart SUB G. Q. Gun Shoot Z-20-S Z-14-CC (R) Z-1-AA(R) Z-1-N(R) Z-3-AA(O) Z-5-N(O) Z-29-G (R) Z-110-E (R) Z-21-S (O) Z-1-E(R)	13 SF-1, 6-M (R) for all departments GQLT NBC Lecture Training Board Z-27-D (Night)
14	15 Mil/Lead Exams E-3 Exams	16 Arrive YOKO DIVISIONAL SCHOOL J. O. School Crypto Drill Z-27-D (Sec II)	17 DIVISIONAL SCHOOL J. O. School Blood Donations Z-27-D (Sec III)	18 Z-27-D (Sec I)	19 Field Day Z-27-D (Sec II)	20 DEPART YOKO C. O. Pers Insp. C. O. Zone Insp.
21	22 G. Q. Battle Prob. Z-6-D Z-10-D Z-24-D Z-27-D	23 DIVISIONAL SCHOOL J. O. School Crypto Drill	24 DIVISIONAL SCHOOL J. O. School	25 Telephone Talker Drill (GQ talkers) PAY DAY	26 Field Day SF-2, 5-M (R) for all departments	27 GQLT NBC Lecture Training Board Z-27-D (Night)
28 Arrive PEARL Z-27-D (Sec III)	29 COMSERVPAC visit G. Q. Z-10-D NBC Lecture Z-27-D (Sec I)	30 Depart PEARL DC Lectures DIVISIONAL SCHOOL J. O. School Crypto Drill	31 DC Lectures DIVISIONAL SCHOOL J. O. School	1 AUG Hand grenade & small arms training for Supply & Engineering	2 AUG Field Day	3 AUG C. O. Zone Insp. C. O. Pers Insp. 5 AUG Arrive SFRAN

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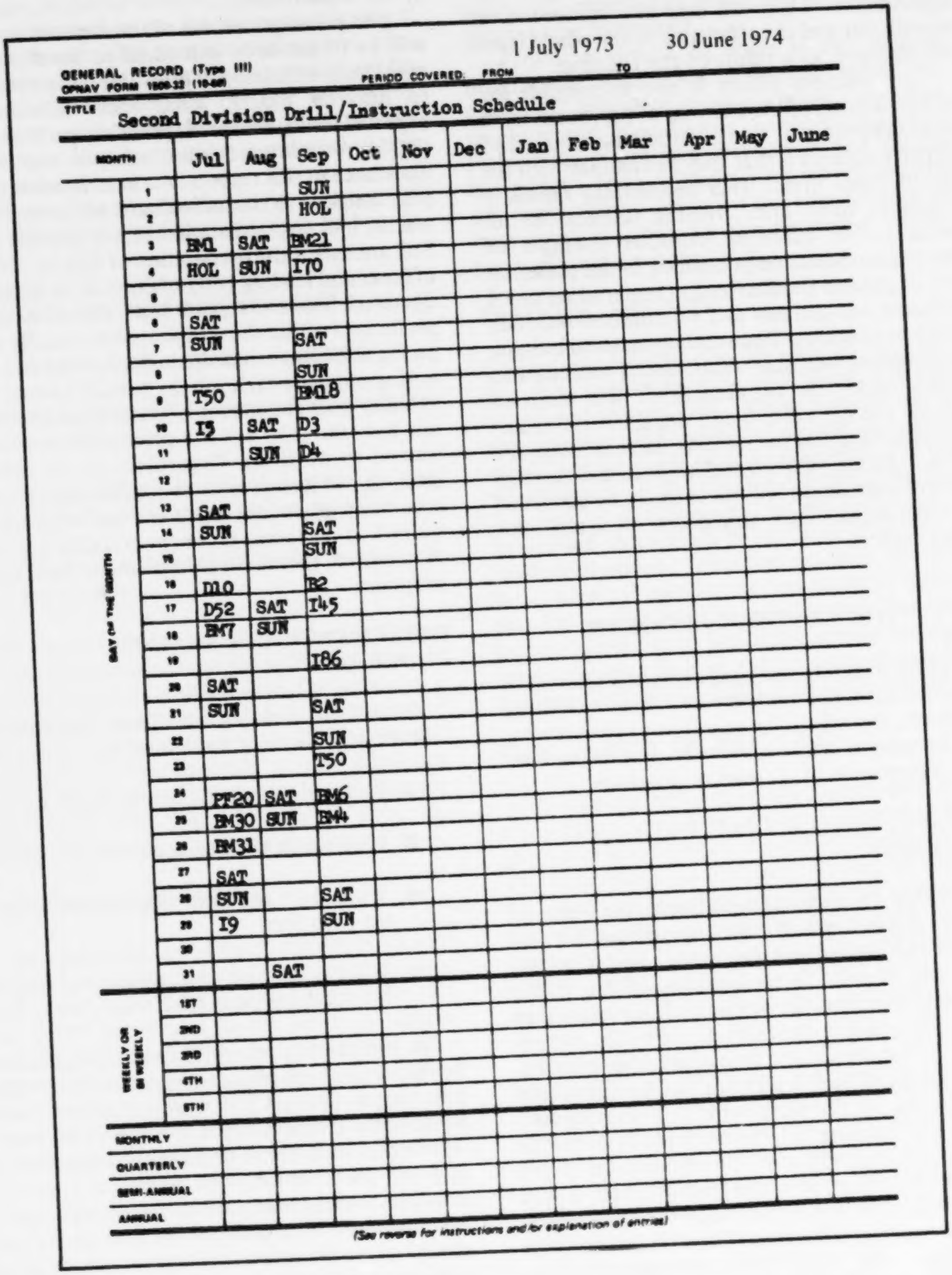
Figure 3-4.—Monthly Training Schedule.



GENERAL RECORD (Type III)
OPNAV FORM 1500-32 (10-69)

PERIOD COVERED: FROM 1 July 1973 TO 30 June 1974

TITLE Second Division Drill/Instruction Schedule

	MONTH	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
DAY OF THE MONTH	1			SUN									
	2			HOL									
	3	BM1	SAT	BM21									
	4	HOL	SUN	I70									
	5												
	6	SAT											
	7	SUN		SAT									
	8			SUN									
	9	T50		BM18									
	10	I5	SAT	D3									
	11		SUN	D4									
	12												
	13	SAT											
	14	SUN		SAT									
	15			SUN									
	16	D10		B2									
	17	D52	SAT	I45									
	18	BM7	SUN										
	19			I86									
	20	SAT											
	21	SUN		SAT									
	22			SUN									
	23			T50									
	24	PF20	SAT	BM6									
	25	BM30	SUN	BM4									
	26	BM31											
	27	SAT											
	28	SUN		SAT									
	29	I9		SUN									
	30												
	31		SAT										
WEEKLY OR BI WEEKLY	1ST												
	2ND												
	3RD												
	4TH												
	5TH												
MONTHLY													
QUARTERLY													
SEMI-ANNUAL													
ANNUAL													

(See reverse for instructions and/or explanation of entries)

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Figure 3-5.—Division Training Schedule.

only of the function of their own department, but also of problems in the "interface" areas between departments. This will help the teamwork to smooth out and the efficiency of the whole team will improve as a result of the training.

The weapons officer is also responsible for certain aspects of the training of personnel from other departments. One qualification required of all petty officers is that they be familiar with the use of small arms. This necessitates regularly scheduled small arms training sessions for all hands to be qualified. Another example of interdepartmental responsibility is the presentation of general familiarization material on naval ordnance and gunnery and ammunition-handling safety precautions. Team and operational training of personnel who man weapons GQ stations also comes under the cognizance of the weapons officer. On the other hand, departmental training responsibilities for subjects, such as telephone talker training, first aid and hygiene, and damage control instruction will most likely be absorbed by other departments more closely associated with these topics.

THE TRAINING PROGRAM

In the following paragraphs we will discuss the establishment and implementation of a training program, including the selection of instructors, the keeping of training records, and the evaluation procedures of a training program.

ESTABLISHING A TRAINING PROGRAM

Within the weapons department, the weapons officer is responsible for the organizing and training of the department for battle. Based on the planning board's interpretations of the ship's training objectives, the weapons officer establishes the objectives that must be reached by the department. It may be expedient to appoint an assistant for training to help in carrying out the mechanics of training, or the weapons officer may choose to do this training. In any case, the department training officer will work closely with the ship's education officer in evaluating instruction and discovering the needs and desires of the personnel for training other than that directly related to their particular billet. The department training officer supervises the preparation of training materials, coordinates the activities of instructors, and receives and evaluates training reports. In brief, the officer makes the training program work in the department.

The primary concern of the department head will be to get each individual to function with maximum efficiency. To do this, it is necessary to discover exactly what each individual is expected to do. Personal Qualification Standards (PQS) records and billet analysis will be of assistance in this respect. An examination of the jobs assigned to the individuals, as shown by the watch, quarter, and station bill, is another lead. Still another is the preparation of lists by division officers and leading petty officers of all machines operated, logs and reports kept, and other duties performed within the weapons divisions. By comparing these lists to eliminate duplication and then noting opposite each job the person's name who actually does the job, it is possible to determine not only the jobs but the persons who must be trained to do them. Regardless of the method used, the objective is to determine and describe accurately what jobs there are and who will be trained to do them. Once the training has been determined, then we can implement the training program.

IMPLEMENTING A TRAINING PROGRAM

When the training has been decided, the following items must be determined.

- In what order will the training be given?
- How much does each person now know?
- What skills and knowledge are required to do each job?
- What is the best time, place, and method for teaching each job?

In establishing priorities for training, it may be found that immediate training needs are those that center around the most commonly used equipment. It may be that a sequence of events will dictate the order of training; and those things that will be done first will be taught first. For example, when putting out to sea, all operations are carried out in an order determined by the conditions of the maneuver. Taking advantage of this opportunity for training will automatically set the order of training.

Determining how much each person knows may not be a simple task. Possession of a rating badge is not in itself sufficient evidence or knowledge. A simple screening test, oral examination, or observation on the job may provide a basis for determining the knowledge level of a group. Also, past training records should not be overlooked in this respect. No one factor will break down enthusiasm for training more than being subjected to instruction in material that is already known.

In instructing a trainee in the development of a skill, there are several basic needs to be kept in mind.

- The instruction must be orderly.
- The instruction must be complete.
- The trainee must be prepared to receive the instruction.
- The training should take place in the operational situation, when possible.
- The instructor must have a plan of instruction.

Merely to have a training program is not enough—the trainees must be willing to do their part. The majority will respond favorably to a training program if they find that the returns are commensurate with the time and effort expended. They will want the program to pay dividends immediately and to be useful in solving the problems of their jobs. In other words, the instruction should be kept on a practical level.

INSTRUCTOR TRAINING

The major burden of instruction rests with the petty officers; therefore, all petty officers must become well-qualified instructors before they can truly fulfill their roles in the Navy. A natural tendency in the selection of an instructor for a particular subject is to choose the most qualified person on that subject. This may ensure the highest quality of instruction, but it tends to place the entire burden of instruction in the hands of a few senior petty officers and consequently stifle the enthusiasm of the junior petty officers. To develop instructor ability at all departmental levels, you should make it a point to choose some instructors from the ranks of the junior petty officers and even the nonrated personnel. It is surprising what results this may bring. To teach a subject, the instructor must be completely familiar with it; and in the case of a junior petty officer, this may entail extensive preliminary study which will benefit this individual as well as the group to be instructed.

Provision should be made in the training program for instruction in training techniques. Class "C" instructor training schools, located on the East and West Coasts, conduct courses of instruction in training techniques and should be used to form a nucleus of school-training personnel. These personnel can then be used as instructors for training the remainder of the petty officers on board ship.

TRAINING RECORDS

The only justification for training records is that they should indicate how much has been accomplished and how much remains to be accomplished. The number of records maintained should be kept to the absolute minimum. The true measurement of an effective shipboard training program is performance; the simplest way to accomplish this should be the basic objective of any record system. Whenever possible, the same forms used to schedule training activities should also be used to record training that has been accomplished. A standardized system of shipboard training schedules and records is thoroughly discussed in OPNAVINST 3120.32A, chapter 8.

EVALUATION OF TRAINING

If training does not satisfy a particular need, it has no purpose. Presumably, the training program was built around the various needs of the ship. Therefore, to evaluate training, all that is necessary is to examine the condition that occasioned the need. For example, suppose that a ship equipped with 5"/54 RF mounts has had repeated loader failures because of broken shear pins, which, in turn, were caused by improper loading. An obvious need for loader training is required. This training should include lectures, followed by actual drills on the loading machine for each of the gun crews. The loading drills should be continued on a daily basis until they have served their purpose; that is, until each of the gun crews is loading smartly and correctly. The final proof of the effectiveness of this training will come during the next firing exercise.

Technical and operational training should be checked to determine whether operational efficiency has increased. In the checking of military training, observations should be made of the military conduct of personnel and their appearance and reactions during morning quarters, inspections, and so forth. Professional training can be evaluated on the basis of advancement examination results. Ask yourself this question: "What percentage of my personnel who were recommended for advancement succeeded in passing the advancement exam?" Team training can be evaluated by actual performance during drills. A drill is intended to put a team or crew through the shakedown phase of training—to give practice in the skills previously learned. You should emphasize correct procedures in early drills, and increase this emphasis on bettering the speed as drills progress.

ENLISTED EVALUATION AND EXAMINATION SYSTEMS

Gaining practical experience from performance of their regular duties, and theoretical knowledge from instructional programs, manuals, and textbooks, gradually qualifies enlisted persons for higher levels of responsibility.

Personnel should be recommended for advancement in rating only if and when they are in all respects fully qualified to hold the higher rate. Advancements should not be made in the nature of rewards for faithful or extended service or simply because the minimum service requirements have been fulfilled. It is a poor personnel practice to advance a person (or to recommend a person for a change in rating) to a position for which the individual is not fully qualified.

Over the years, the Navy has endeavored to be selective in accepting personnel for enlistment. Therefore, the vast majority of enlisted personnel should be competent in the performance of their duties. The "average" Navy enlisted person should be one whom any commanding officer would welcome into his command. To make the enlisted performance evaluation system successful, it is desirable to assume that each command has an average crew. The proportion of individuals who exceed or fall below the average in performance then would be about the same for all commands. For the overall good of the Navy and in the interest of the great majority of enlisted personnel, the evaluation system should be related in general to the average crew concept.

One of the primary purposes of the evaluation system is to permit the commanding officer to exert positive influence on the advancement opportunities of the individuals of the command. So the "performance factor" in the final multiple for advancement will be effective, evaluations must differentiate between individuals so that credit is given according to demonstrated performance. Should all individuals be evaluated too highly, the ability to assist those individuals who are, in fact, outstanding will be reduced.

PERFORMANCE EVALUATION

The purpose of the performance evaluation system for enlisted personnel is to provide specific factual information for use in selecting individuals for advancement, appointment to commissioned officer status, assignment to special duties and to educational programs; and for selecting personnel for any program or assignment that might require individual background information. The most significant personnel management tool in the enlisted personnel record is the enlisted performance evaluation report.

It should be noted that the enlisted performance evaluation report should not be the only method of advising personnel of their performance, but that, on a regular basis, performance counseling of each individual should be conducted.

The Navy Enlisted Performance Evaluation System (NAVMILPERSCOMINST 1616.1A) sets forth the instructions for preparation and submission of enlisted performance evaluation reports.

NAVPERS Form 1616/24 is used to report evaluations of all pay grades. However, there are a few differences between pay grades as far as evaluation reporting is concerned. You should consult NAVMILPERSCOMINST 1616.1A for guidance.

EXAMINATION SYSTEM

Servicewide examinations for advancement in rating are conducted semiannually for pay grades E-4 through E-6 and are conducted annually for pay grade E-7. Advancement in rating examinations for pay grades E-8 and E-9 have been discontinued; however, the selection board for these pay grades still meets annually. For further information, consult the latest BUPERS Notice 1418 on Navy-wide examinations for advancement in rate.

Advancement examinations for each rating are developed at Saufley Field, Pensacola, Florida. Military/leadership examinations, also developed at Saufley Field for pay grades E-4 through E-6 are standardized and are administered within the local commands; once the examinee has successfully passed the examination, no retest is required. *The Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards*, NAVPERS 18068-D, is the basic reference regarding occupational standards, along with other current OPNAV directives.

CATEGORIES OF SHIPBOARD ENLISTED TRAINING

There are several subject matter categories that petty officers and nonrated personnel are required to know. This subject matter may be arranged in a number of ways, and various classifications may be used. Classifying and organizing subject matter ensures that nothing will be overlooked. There will be no gaps in the instruction, nor will there be overlapping with a consequent loss of time and effort. The following breakdown is based upon enlisted training objectives and includes all necessary categories.

ORIENTATION

Orientation is a period of indoctrination that each new person reporting on board receives. This may only require familiarization with the ship's regulations, organization, and the physical layout in the case of seasoned petty officers. For recruits, however, a much more extensive orientation program will have to be employed. Using an orientation program checkoff list is a practice adopted in many commands. This checkoff list is completed within a specified time limit under the direct supervision of an experienced petty officer. This list may be made a part of the person's individual training record. On board larger ships, the I-Division usually serves to fulfill this indoctrination requirement.

MILITARY TRAINING

Military training includes training in military customs and courtesy, naval discipline, and other related subjects. Under related subjects, we might properly include citizenship or conduct ashore, and the social and civil implications of life in a military atmosphere. In a broader sense, United States citizenship responsibilities is a worthwhile subject of interest to all. Also worthy of mention is the individual's role in the Navy and the need for constant readiness.

PROFESSIONAL TRAINING

Professional training is training in the skills and knowledge personnel must have to do their jobs and advance in rates. Almost without exception, advancements are made as a result of inservice education and training. Division officers should always bear in mind that, in addition to their other responsibilities, they are personally responsible for the education, training, and progress of each individual in the division.

OPERATIONAL TRAINING

Operational training is the training a person receives while on watch or at the general quarters station. This training will be aimed at developing individual and team battle efficiency, developing minimum operational requirements in all hands, and training replacements required in the event of casualties.

LEADERSHIP

Leadership is one of the major fields in which every petty officer and potential petty officer must be trained. Administration and supervision play an important part in this area. A supervisor must have—arbitrarily—five classes of knowledge.

1. Knowledge of the job with which to supervise and a reasonable amount of skill in the performance of that job.
2. Sufficient knowledge of policy to interpret and administer that policy.
3. Knowledge of how to handle personnel to obtain the greatest production possible.
4. Knowledge of job methods, including the shop or work area arrangement, assigning personnel to jobs, and otherwise carrying on the work with the greatest possible efficiency.
5. Knowledge of instructional methods.

OFFICER TRAINING

Training for officers differs slightly from training for personnel. In both cases, there are items of information and items of skill—things the trainee must know and things the trainee must be able to do. Considerably more emphasis should be placed on instructing officers in the techniques of training, administration, supervision, and leadership. In many cases, an officer may be taught to "know how to do" rather than "how to do." The distinction is that an officer must know the method—the steps of procedure—but need not be skillful in the actual performance. If an officer also develops the attendant skills, this officer will be correspondingly better equipped for supervisory and training duties.

In addition to the responsibilities for enlisted personnel training, it is the responsibility of the executive officer to inaugurate and supervise a training program for junior officers. It should be remembered that the well-trained and well-informed junior officer is the basis of a well-trained crew.

SCOPE OF OFFICER TRAINING

Just as in enlisted personnel training, there are certain areas that should be covered in an officer's training program. First among these should be an officer's orientation program. This would normally be much broader in scope than the enlisted personnel orientation program and should encompass the activities and responsibilties of all departments rather than just one. It may even include assignment to each of the departments for a short period of time. Because an officer's varied duties often call for decisions that must be based upon complete familiarity with the ship and its organization, the orientation program will soon prove its worth. Emphasis should be placed on familiarization with the capabilities and limitations of the ship's machinery and armament.

The next broad area of officer training to be considered is training in preparation for qualification as officer of the deck (OOD), in port and underway. Although direct responsibility for OOD training is usually assigned to the senior watch officer (or the navigator), as a department head, you should feel concerned with all phases of your junior officers' training. Actually, qualification as an OOD is one of the most important steps in a junior officer's career and is a necessary prerequisite to being qualified for command at sea. On many ships, qualification as a CIC watch officer (and in some cases engineering watch officer) is considered part of the training program for OODs and is of particular benefit to all officers in the weapons department.

WEAPONS TRAINING

Junior officer training in weapons duties is a direct responsibility of the department head. In some cases, the type commander has issued training courses designed to prepare junior officers for specific departmental duties. This is an excellent method of attaining the desired knowledge but should be augmented with individual instruction and supplementary reading. Many officers assigned to the weapons department are only vaguely familiar with the aids furnished them through the various ordnance publications.

There is a natural tendency to keep a person in a job that the person knows. This stems from a desire to achieve and maintain a smooth working unit, group, or division. However, by limiting the experience level of the individual, no provision is made for casualty replacement or for advancement of personnel into positions of greater responsibility. For these reasons, every junior officer should be rotated through the various jobs within the department and should be in constant training for added responsibility. The subject matter should include details of all weapons systems aboard, their tactical employment, and their administrative appendixes as well as general study of the equipment in use in weapons spaces.

Because an officer's duties are primarily supervisory, leadership training assumes major importance. As a result, leadership training aids of all sorts are available for incorporation into the ship's training program.

In addition to training in the above subject matter areas, all officers are expected to devote some of their time to general professional study. This will usually consist of self-study correspondence courses that are designed to assist officers in improving their professional qualifications and broadening their general knowledge of naval subjects. NAVEDTRA 10061 contains a list of the courses available in the Navy.

TYPE COMMANDERS' REQUIREMENTS

Most type commanders have training courses for junior officers. These courses, when used with the junior officer's qualification standards, are valuable training aids. You, as weapons officer, should encourage your division officers to make maximum use of them. Upon completion of each course, a course completion letter should be filed in the officer's service record to substantiate to the present and future commands the state of individual training received.

RESPONSIBILITY OF AN OFFICER FOR CONTINUOUS TRAINING

You, as a naval officer, should never stop learning. It is your duty as a naval officer to continue to learn new methods and procedures and to continuously evaluate the effectiveness of older methods. As stated above, all officers are expected to devote some of their time to general professional study. Not only will such study increase your value and usefulness to the Navy, it will also give you the personal satisfaction of being able to effectively solve your professional problems.

OFFICER EVALUATIONS

As a weapons officer, you will be in charge of one or more division officers and junior division officers. You may be asked to complete the initial work sheet for the evaluation of their performance. This report on officer fitness is required by U.S. Navy Regulations, and the procedure to be followed is set forth in NAVMILPERSCOMINST 1611.1 (with changes). If you are asked to do this job, or to provide detailed information on junior officer performance, consider it an honor. It indicates that your seniors respect your judgment. Remember that the fitness report is the most important controlling document in an officer's career. You should evaluate a junior officer's performance as carefully and as fairly as you expect your seniors to evaluate your performance.

REFERENCE LIST

Navy Enlisted Manpower and Personnel Classification and Occupational Standards, NAVPERS 18068D, Office of the Chief of Naval Personnel, Washington, D.C., September 1975.

Report on the Fitness of Officers, NAVMILPERSCOMINST 1611.1, Office of the Commander, Naval Military Personnel Command, Washington, D.C., May 1983.

Standard Organization and Regulations of the U.S. Navy, OPNAVINST 3120.32A, Office of the Chief of Naval Operations, Washington, D.C., March 1979.

The Navy Enlisted Performance Evaluation System, NAVMILPERSCOMINST 1616.1A, Office of the Commander, Naval Military Personnel Command, Washington, D.C., May 1983.

United States Navy Ordnance Safety Precautions, OP 3347, Naval Sea Systems Command, Washington, D.C., February 1972.

United States Navy Regulations, 1973, Office of the Secretary of the Navy, Washington, D.C., February 1973.

CHAPTER 4

SHIPBOARD MAINTENANCE, REPAIR, AND OVERHAULS

In this chapter, we will discuss the types of maintenance and how each maintenance action is accomplished. We will also discuss how the 3-M Systems can improve material readiness, and how it can present information on repair activities. We will then discuss the actions that should be taken before, during, and after an overhaul.

INTRODUCTION

The heads of departments are responsible for the control and maintenance of material assigned to them. They are guided in this task by directives issued by the various technical commands and type commands. To send ships to sea with the confidence that they will be ready to meet any and all commitments is the desire of every commander. To meet these challenges, a sound maintenance program is required that will provide material reliability and contribute to the success of the ship's mission.

Constant attention should be given by all concerned to material upkeep, with emphasis being placed on its importance.

MAINTENANCE PLANNING

Implementation and adherence to the planned maintenance system (PMS) and maintenance data system (MDS) of the Standard Navy Maintenance and Material Management Systems, the 3-M Systems, gives the weapons officer and subordinates a sequence of events that, if followed properly, will help to reduce the time, money, and manpower required to be allocated to correct defects and casualties during repair and upkeep periods and regular overhaul. By following these schedules of events, you have the benefit of being helped to reduce the administrative paper work that is inevitable during these periods.

The overall responsibility for the condition of a ship's machinery and installed equipment rests with the commanding officer. The commanding officer relies on the department heads to ensure that effective management practices are followed. As weapons officer, you will be responsible to the commanding officer for the proper material condition of all ordnance equipment on board. Poor management policy on your part could easily result in an aborted training exercise. In wartime, it could result in the loss of the ship.

The value of any ordnance item is measured in terms of its ability to perform as designed. It is valueless if, because of faulty maintenance, it is not ready when needed. Maintenance can be divided into two general categories—preventive and corrective.

Preventive Maintenance

This type of maintenance procedure is designed to forestall or forewarn appropriate authority of impending trouble. It includes regular and systematic lubrication, routine tests, and inspections, prefiring and postfiring checkoffs, maintenance of records, and advance planning.

Corrective Maintenance

This maintenance procedure is designed to correct an existing deficiency. It could include the actual correction of deficiencies, maintenance of records and spare parts, advance planning and follow-up actions for shipyard and tender availabilities.

One consideration in ordnance equipment design is its maintenance accessibility. Most corrective maintenance and nearly all preventive maintenance can therefore be performed by shipboard personnel using the available facilities and equipment. There is a growing tendency to depend upon external resources for accomplishment of overhaul work that is within the capabilities of ship's personnel. This practice can cause a lowering of professional standards and a shortage of properly trained personnel. The magnitude or complexity of a particular work item may necessitate calling on a repair activity for assistance. A major goal of your maintenance program should be to instill and develop self-confidence and self-sufficiency in your personnel.

Operational Maintenance

This is not a general division of maintenance in the narrow meaning of the term as are the above two forms of maintenance. Preventive and corrective maintenance should be, and in most instances are, carried on daily whether the ship is operating or not. If the 3-M Systems schedules are adhered to, by and large, all maintenance will be carried out. (The 3-M Systems will be discussed in more detail a bit later.) However, fleet commitments have grown and at-sea periods are longer, so many jobs scheduled under the 3-M Systems covering the two general categories are being delayed to in-port upkeep periods. Some of this is necessary; for instance, the 6-month requirement for inspection of the anchor chain must be delayed until the ship's schedule puts it into a port which has the facilities available for this type of job. The flexibility of the 3-M Systems provides for this type of decision.

Other types of jobs, such as the annual inspection of life rafts, would normally be done during an upkeep or availability period while in port. This type of job can be accomplished at sea, or at least started while the ship is at sea, by completing one raft at a time. It doesn't have to be delayed until an in-port period. Whether or not to delay a scheduled item depends heavily upon the ship's schedule; the type of schedule is most important. More likely than not, the carrying out of this type of maintenance will involve a command decision after you give the commanding officer an adequate briefing. The maintenance described in this section are those jobs that are large, scheduled semiannually or annually, fall due during an operational period, but can be done bit by bit without affecting to a great extent the safety or operations of the ship under the present schedule.

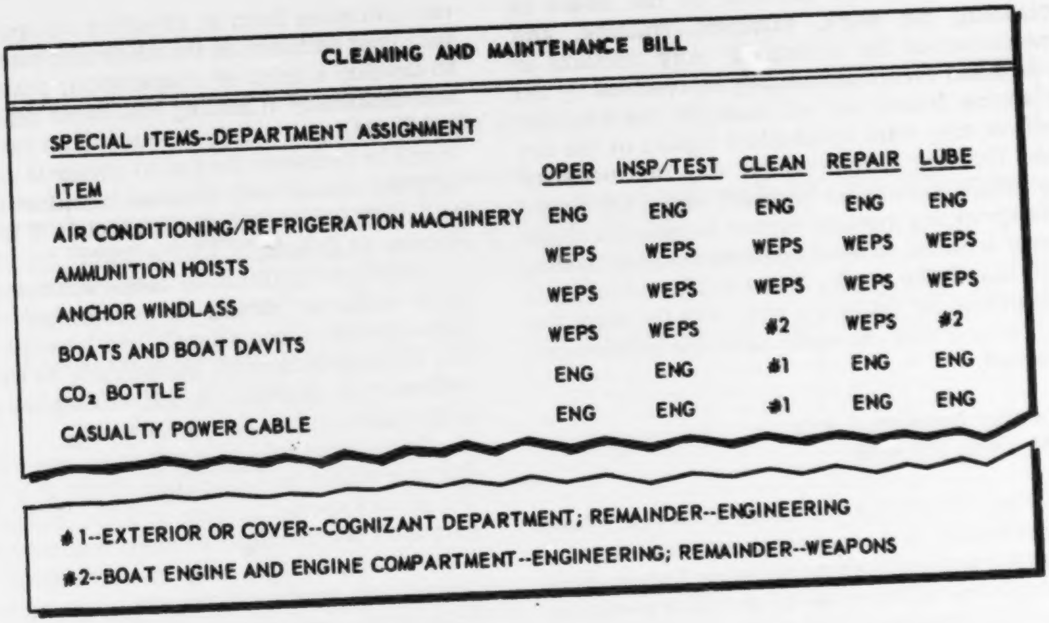
Cleaning and Maintenance Bills

General procedures for cleaning and maintenance are found on board U.S. Navy ships in the *Ship's Organization and Regulations Manual*. Detailed procedures for preventive maintenance and repair of the material are presented in Systems Command's manuals, manufacturers' instruction books, and type commander's instructions. Chapter 3 of the *Ship's Organization and Regulations Manual* usually contains a cleaning and maintenance bill that establishes responsibilities by individual divisions (in some cases by individual departments) for cleaning and maintaining all spaces and equipment on the ship. In cases where there is mutual responsibility for specific equipment, a special section of the cleaning and maintenance bill will spell out the departmental responsibilities. (See figure 4-1.)

In addition to the *Ship's Organization and Regulations Manual*, you should have a weapon's department organization manual, and, possibly, division organization manuals. These provide supplementary information to the *Ship's Organization and Regulations Manual* and should outline, in detail, individual responsibilities down to the lowest operating levels. Normally the assignments for cleaning and maintenance have evolved over a considerable period of time and should be reasonably stable. Various factors, such as personnel allowances, technical command responsibility, accessibility, and equitable distribution of the work load, may influence these assignments; permanent changes in any of these factors may have to be reflected by changes in the cleaning and maintenance bill. Assignments under the 3-M Systems induce changes of a pertinent nature. However, most changes are of a transitory nature and may be corrected by a temporary working agreement with the division or department concerned. Once again the importance of interdepartmental cooperation cannot be overstressed.

On ships with a variety of equipment, it has been found to be advantageous, both to the personnel and to the ship, to rotate cleaning stations assignments at regular intervals. This has a dual purpose: (1) it serves to provide the individuals with diversified experience, and (2) it eliminates the possibility of single personnel transfers disrupting the orderly progress of preventive maintenance. As weapons officer, you have the responsibility to indoctrinate each person under your authority in all aspects of the rating. Some degrees of specialization may be necessary, but don't be the type of weapons officer who develops specialists only. Consider the worth of the so-called small arms experts, and compare them with individuals who have had a variety of experience. It will be apparent which person is better equipped to fit into your organization.

Don't fail to take advantage of every opportunity to broaden the experience level of your personnel—particularly during corrective



CLEANING AND MAINTENANCE BILL

SPECIAL ITEMS--DEPARTMENT ASSIGNMENT

ITEM	OPER	INSP/TEST	CLEAN	REPAIR	LUBE
AIR CONDITIONING/REFRIGERATION MACHINERY	ENG	ENG	ENG	ENG	ENG
AMMUNITION HOISTS	WEPS	WEPS	WEPS	WEPS	WEPS
ANCHOR WINDLASS	WEPS	WEPS	WEPS	WEPS	WEPS
BOATS AND BOAT DAVITS	WEPS	WEPS	#2	WEPS	#2
CO_2 BOTTLE	ENG	ENG	#1	ENG	ENG
CASUALTY POWER CABLE	ENG	ENG	#1	ENG	ENG

#1--EXTERIOR OR COVER--COGNIZANT DEPARTMENT; REMAINDER--ENGINEERING

#2--BOAT ENGINE AND ENGINE COMPARTMENT--ENGINEERING; REMAINDER--WEAPONS

63.9

Figure 4-1.—Portion of typical cleaning and maintenance bill.

maintenance. Quite often this will be the only opportunity many of them will have to see the internal mechanisms of an assembly. As you know, it is often difficult to visualize a mechanical operation, even when it is accompanied by photographs and diagrams. Get in there yourself and take a look; you'll find the experience worthwhile! The person actually engaged in disassembly may be able to give a running commentary on the disassembly procedures to a small group. On-the-job training can be the most efffective of the many training methods if care and thought are exercised in the planning and organizing stages. Often unncessary corrective maintenance has to be done because preventive maintenance under the 3-M Systems was improperly performed by inexperienced personnel.

COORDINATION OF MAINTENANCE PLANNING

The commanding officer must be kept informed of all casualties that might affect the assignment of the ship. Telling the captain verbally that a part of the sonar equipment has failed may momentarily suffice on a destroyer; however, a more formal procedure may be necessary later. One method often used is the forwarding of a report on the status of equipment at a designated time, such as at eight o'clock reports. Regardless of the manner in which it is done, a report should be made promptly when a casualty occurs, and again when it is repaired. Some things the commanding officer will want to know in connection with the casualty are (1) the extent of the damage, (2) the length of time to complete repairs (including availability of parts and technical help), (3) the effect the casualty has on battle readiness, and (4) the standby measures to be taken. Direct permission of the commanding officer must be obtained before disabling any machinery or equipment when such action may adversely affect the safety or operation of the ship.

The Executive Officer and the Planning Board

One of the primary duties of the executive officer is to coordinate the efforts of the departments. The executive officer has the task of reducing interdepartmental differences to a minimum and ensuring a smooth progression of the ship's routine. Daily scheduling of the various events that will take place is one of the responsibilities, and you should keep the executive officer informed of any matters affecting this schedule. The executive officer, as chairman of the planning board, directs the activities of the board in planning the work, exercises, training, and education of the command. Any conflicts in scheduled events can usually be resolved by the planning board. As an example, the engineer officer may want to schedule repairs of the fire and flushing system on the day the magazine sprinkling systems are normally tested. Obviously the sprinkling systems cannot be tested without water pressure, so some agreement or rescheduling will have to be made. This and like subjects are considered by the board and, with the executive officer as arbiter, mutually agreeable solutions are reached.

Training Integrated with 3-M Cycle Schedule

The 3-M Systems is intended to assist Navy operational and technical commanders in attaining and maintaining optimum fleet readiness through the efficient use of available resources. The 3-M Systems is primarily designed to cut repair or replacement costs and manpower waste by the detailing and properly scheduling of maintenance. It has another use which is not adequately recognized. The 3-M cycle schedule (fig. 4-2) can be used in a secondary role as background which the planning board may integrate not only into the ship's training schedule, but also into the departmental training schedules. The best way to visualize the requirements is to have all department heads schedule their training requirements similarly to the quarterly schedule format and then compare them at the planning board meeting. These topics are discussed in the chapter on training. The scheduling of maintenance as reviewed by the planning board on information reflected on the cycle schedules may also be used to reduce conflicts between departments on both scheduled maintenance and training when matched against the ship's operational schedule. Type commander's and other requirements may be scheduled so as to avoid the tendency to "bunch up" at the end of a period. The cycle schedule will be discussed in detail later in this chapter.

Interdepartmental and Departmental Coordination

As a department head, you, the weapons officer, will find it necessary to repress some of the interests of your own department for the betterment of the ship as a whole. Try to analyze each situation from an objective viewpoint, and base your decisions on the whole ship's needs. Try to develop a spirit of cooperation; practice tact and diplomacy in dealing with other department heads, and you will find your job an easier one. It will be necessary for you to engage in close and frequent contact with the other department heads, and upon your relations with them will hinge the success or failure of your efforts.

This same attitude of cooperation and common endeavor should be encouraged in your subordinates. Close, friendly relationships among the enlisted personnel, particularly at the petty officer level, can result in that welding job getting done today rather than next week.

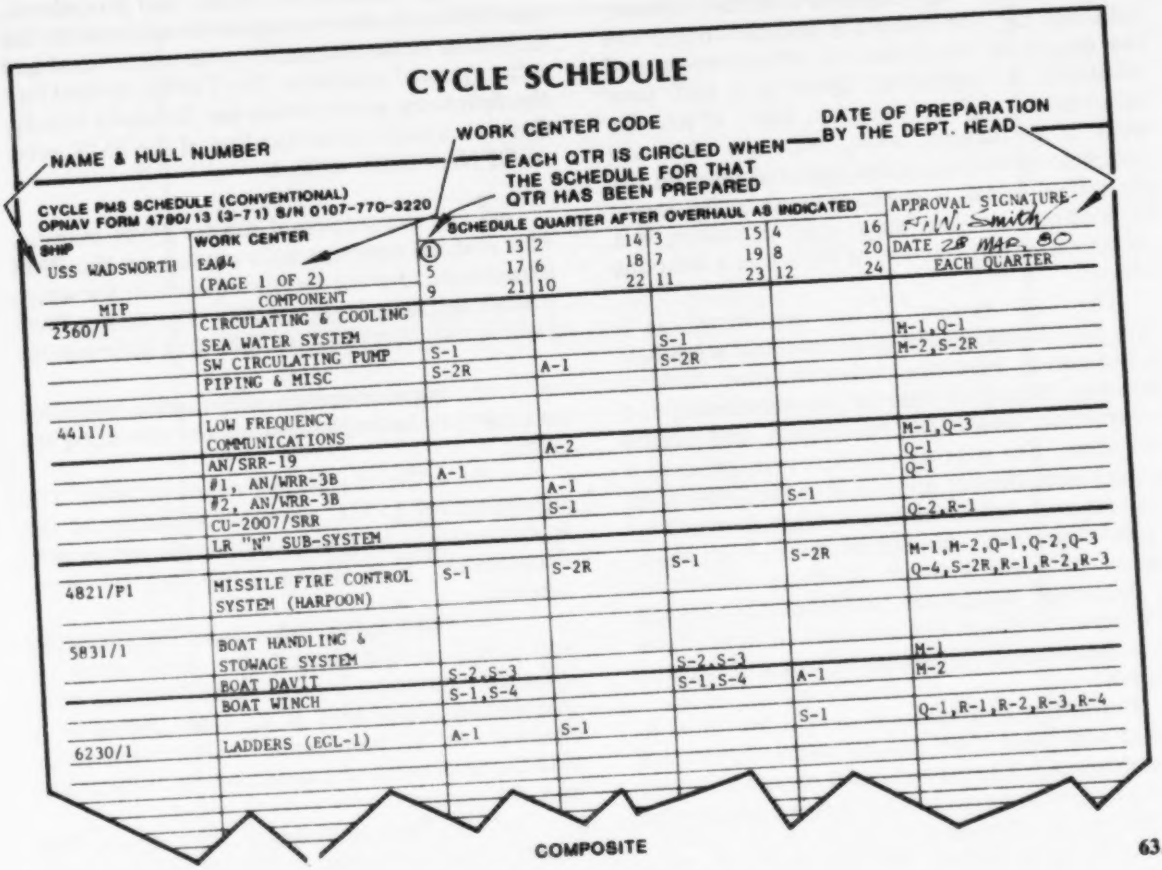
Quite often jobs of a minor nature will arise that are within the capabilities of the ship's force but require special training or skills. Welding and carpentry are examples of skills that may not be available to you in the weapons department. Large ships have a capable repair gang in the engineering department that can provide these special skills, and a work request system similar to that used in shipyards and tenders may be in effect. On smaller ships, the repair gang usually consists of just a few individuals, and a simple verbal request to the engineer office may suffice. Keep in mind that many demands are made on the talents of the repair gang and that work performed for the weapons department is just part of their normal work load.

Coordination with Outside Activities

Another area in which some effort should be expended is in departmental relations with outside activities. The ship willing to lend a helping hand is the one that always succeeds in getting a majority of its work accomplished during availabilities and overhauls. Get to know the people responsible for getting the job done. Remember their names and how to contact them. Whenever someone from a repair activity is aboard, make sure you are informed of their presence and that one of your personnel is assigned to attend to their needs. Your own personnel are familiar with the eccentricities and differences in your particular installation and can render invaluable assistance to the repair person.

THE 3-M SYSTEMS

The Ships' 3-M Systems was designed for maintenance management. It consists of the planned maintenance system (PMS), inactive


CYCLE SCHEDULE
NAME & HULL NUMBER
WORK CENTER CODE
EACH QTR IS CIRCLED WHEN THE SCHEDULE FOR THAT QTR HAS BEEN PREPARED
DATE OF PREPARATION BY THE DEPT. HEAD
COMPOSITE

CYCLE PMS SCHEDULE (CONVENTIONAL)
OPNAV FORM 4790/13 (3-71) S/N 0107-770-3220

SHIP USS WADSWORTH	WORK CENTER EA04 (PAGE 1 OF 2)	SCHEDULE QUARTER AFTER OVERHAUL AS INDICATED ① 13 5 17 9 21	2 14 6 18 10 22	3 15 7 19 11 23	4 16 8 20 12 24	APPROVAL SIGNATURE F.W. Smith DATE 28 MAR. 80 EACH QUARTER
MIP	COMPONENT					
2560/1	CIRCULATING & COOLING					M-1,Q-1
	SEA WATER SYSTEM			S-1		M-2,S-2R
	SW CIRCULATING PUMP	S-1		S-2R		
	PIPING & MISC	S-2R	A-1			
4411/1	LOW FREQUENCY					M-1,Q-3
	COMMUNICATIONS		A-2			Q-1
	AN/SRR-19	A-1				Q-1
	#1, AN/WRR-3B		A-1		S-1	
	#2, AN/WRR-3B		S-1			Q-2,R-1
	CU-2007/SRR					
	LR "N" SUB-SYSTEM					
4821/P1	MISSILE FIRE CONTROL	S-1	S-2R	S-1	S-2R	M-1,M-2,Q-1,Q-2,Q-3 Q-4,S-2R,R-1,R-2,R-3
	SYSTEM (HARPOON)					
5831/1	BOAT HANDLING &					
	STOWAGE SYSTEM			S-2,S-3		M-1
	BOAT DAVIT	S-2,S-3		S-1,S-4	A-1	M-2
	BOAT WINCH	S-1,S-4			S-1	Q-1,R-1,R-2,R-3,R-4
6230/1	LADDERS (ECL-1)	A-1	S-1			

63.77

Figure 4-2.—Cycle PMS Schedule.

equipment maintenance (IEM), maintenance data system (MDS), alteration management system (AMS), and intermediate maintenance management system (IMMS).

3-M Systems Objectives

The primary objective of the Ships' 3-M Systems is to provide for managing maintenance and maintenance support in a manner that will ensure operational readiness for the maximum equipment. To this end, the intermediate objectives of the 3-M Systems are as follows:

1. To achieve uniform maintenance standards and criteria
2. To achieve maximum effective use of available manpower and material resources in maintenance and maintenance support efforts
3. To provide documentary information on maintenance and maintenance support actions
4. To provide for the improvement of maintainability and reliability of systems and equipment through analysis of documented maintenance information
5. To make provisions for the means of reporting ships' configuration changes
6. To provide for the identification and reduction of maintenance costs and maintenance support in terms of manpower and material resources
7. To provide for the reduction of costs due to accidental material damage by accurate identification and analysis of the costs

3-M Systems Description

The Navy Maintenance and Material Management (3-M) Systems has been implemented in the

Navy as an answer to the ever-present problem of maintaining a high degree of material readiness. Although the 3-M Systems is designed to improve the degree of readiness, its effectiveness and reliability is dependent upon you and your subordinates. The accuracy with which the work is performed, along with the neat and complete recording of the required data on the prescribed forms, is one of the keys to the degree of readiness of your ship, and, therefore, is a reflection of your success or failure as a weapons officer.

The 3-M Systems is not envisioned as a cure for all equipment problems and attendant maintenance resource demands, nor does it eliminate the urgent need for good leadership and supervision based on experience and sound judgment. The systems will, however, produce a logical and efficient approach to the solution of maintenance problems and a large reservoir of knowledge about maintenance. Proper application of these systems products will result in improved equipment performance with less maintenance effort and will lead to meaningful improvements in equipment design and logistics support.

Preventive maintenance should not be confused with corrective maintenance. Preventive maintenance is a scheduled check on selected parts of a piece of equipment. Corrective maintenance is the repair of equipment.

As weapons officer, be concerned with both the planned maintenance system and portions of the maintenance data system.

The parts of the 3-M Systems were discussed earlier; now we are going into a more detailed description of each part. The basic instruction for the Ships' 3-M Systems is OPNAVINST 4790.4, which has been incorporated into one volume instead of the previous three volumes.

PLANNED MAINTENANCE SYSTEM (PMS).—The PMS supersedes all previous planned or preventive maintenance systems or programs. Where a difference exists between PMS and other technical publications or systems, PMS requirements will be used. All differences must be reported on a PMS feedback report (OPNAV Form 4790/7B). Equipment not supported by a PMS will continue to be maintained until the PMS is developed and integrated.

The PMS provides each ship, department, division, and supervisor with the administrative tools to plan, schedule, and control planned maintenance effectively.

Though standard in concept and procedures, the PMS is flexible enough to be adjusted by the ship so as to be compatible with operational and other types of schedules. The PMS is divided into the following areas, which are discussed briefly. For a thorough understanding of the PMS, refer to OPNAVINST 4790.4.

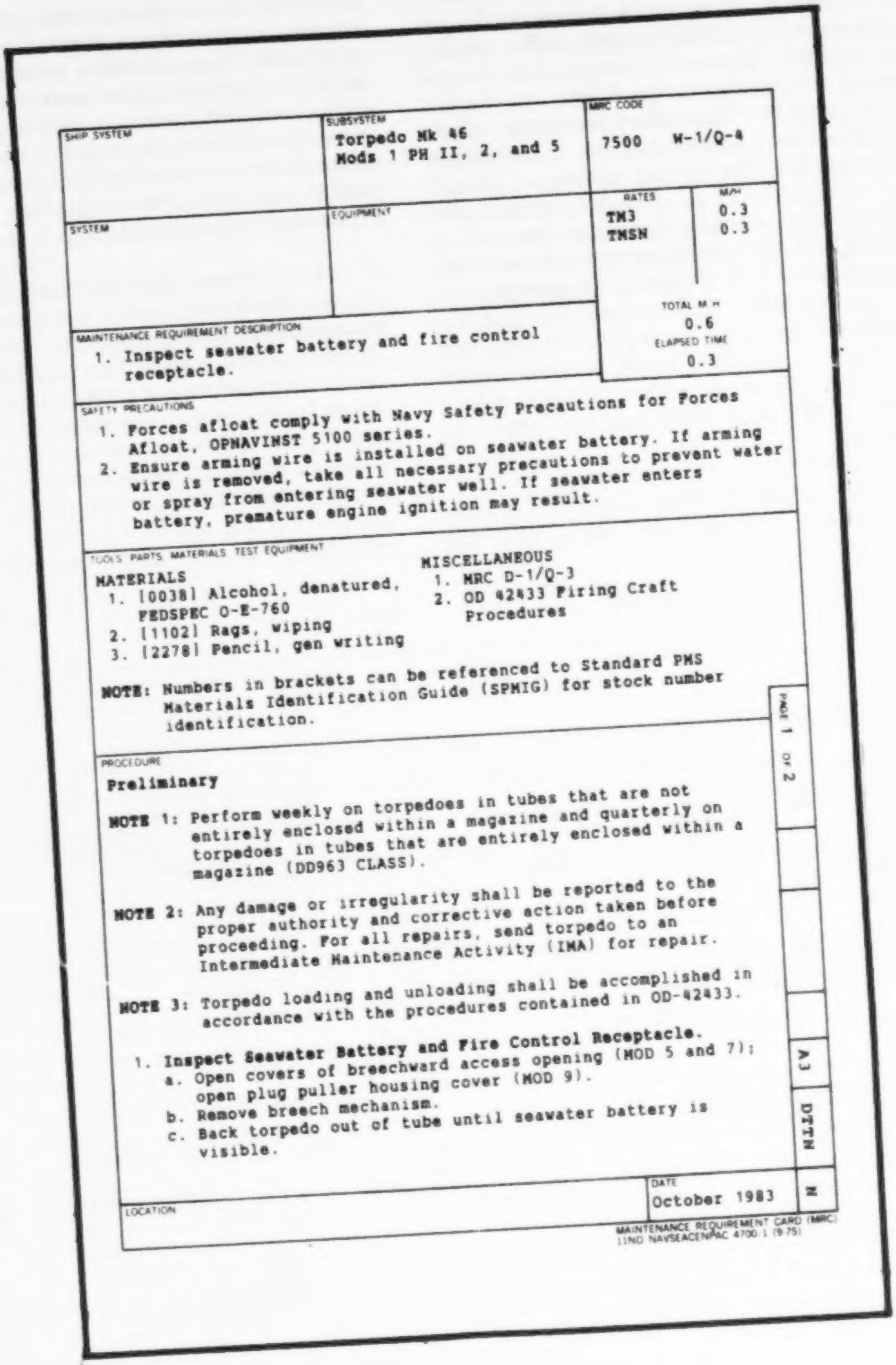
- The departmental master PMS manual. This manual contains information on the PMS requirements for the specific equipment for which your department is responsible. The master PMS manual should contain the following information:

1. Supplementary information provided to assist you in implementing and executing the PMS.
2. A list of effective pages (LOEP). The departmental LOEP provides a listing of the maintenance index pages (MIPs) assigned to each department. This listing is divided by work centers.
3. Maintenance index pages (MIPs). MIPs are prepared and issued for each piece of installed equipment for which the PMS has been established. Each MIP is an index listing of a complete set of maintenance requirement cards (MRCs) applicable to a ship's system, subsystem, and equipment.
4. MIPs to work center index report. This report must be included in the semiannual force revision package that is used to update PMS packages. It also provides the ship's accountability and control of the current MIPs to work centers.

The departmental master PMS manual is located as directed by the ship's department heads for use in planning, scheduling, and supervising required maintenance.

- Work center PMS manual. This manual represents a portion of the departmental master PMS manual that contains only the planned maintenance requirement applicable to a particular work center. It is designed to provide a ready-reference of planned maintenance requirements for the work center supervisor. It should be retained in the working area in the holder next to the weekly PMS schedule.

- Maintenance requirement card (MRC). An MRC (fig. 4-3) provides detailed procedures for performing maintenance requirements. It tells who, what, how, and with what resources a specific requirement is to be accomplished. The



SHIP SYSTEM	SUBSYSTEM Torpedo Mk 46 Mods 1 PH II, 2, and 5	MRC CODE 7500 W-1/Q-4
SYSTEM	EQUIPMENT	RATES: TM3 M/H: 0.3 RATES: TMSN M/H: 0.3 TOTAL M/H 0.6 ELAPSED TIME 0.3

MAINTENANCE REQUIREMENT DESCRIPTION

1. Inspect seawater battery and fire control receptacle.

SAFETY PRECAUTIONS

1. Forces afloat comply with Navy Safety Precautions for Forces Afloat, OPNAVINST 5100 series.
2. Ensure arming wire is installed on seawater battery. If arming wire is removed, take all necessary precautions to prevent water or spray from entering seawater well. If seawater enters battery, premature engine ignition may result.

TOOLS, PARTS, MATERIALS, TEST EQUIPMENT

MATERIALS

1. [0038] Alcohol, denatured, FEDSPEC O-E-760
2. [1102] Rags, wiping
3. [2278] Pencil, gen writing

MISCELLANEOUS

1. MRC D-1/Q-3
2. OD 42433 Firing Craft Procedures

NOTE: Numbers in brackets can be referenced to Standard PMS Materials Identification Guide (SPMIG) for stock number identification.

PROCEDURE

Preliminary

NOTE 1: Perform weekly on torpedoes in tubes that are not entirely enclosed within a magazine and quarterly on torpedoes in tubes that are entirely enclosed within a magazine (DD963 CLASS).

NOTE 2: Any damage or irregularity shall be reported to the proper authority and corrective action taken before proceeding. For all repairs, send torpedo to an Intermediate Maintenance Activity (IMA) for repair.

NOTE 3: Torpedo loading and unloading shall be accomplished in accordance with the procedures contained in OD-42433.

1. **Inspect Seawater Battery and Fire Control Receptacle.**
   a. Open covers of breechward access opening (MOD 5 and 7); open plug puller housing cover (MOD 9).
   b. Remove breech mechanism.
   c. Back torpedo out of tube until seawater battery is visible.

PAGE 1 OF 2

A3

DTTN

N

LOCATION

DATE October 1983

MAINTENANCE REQUIREMENT CARD (MRC)
11ND NAVSEACENPAC 4700/1 (9-75)

98.176

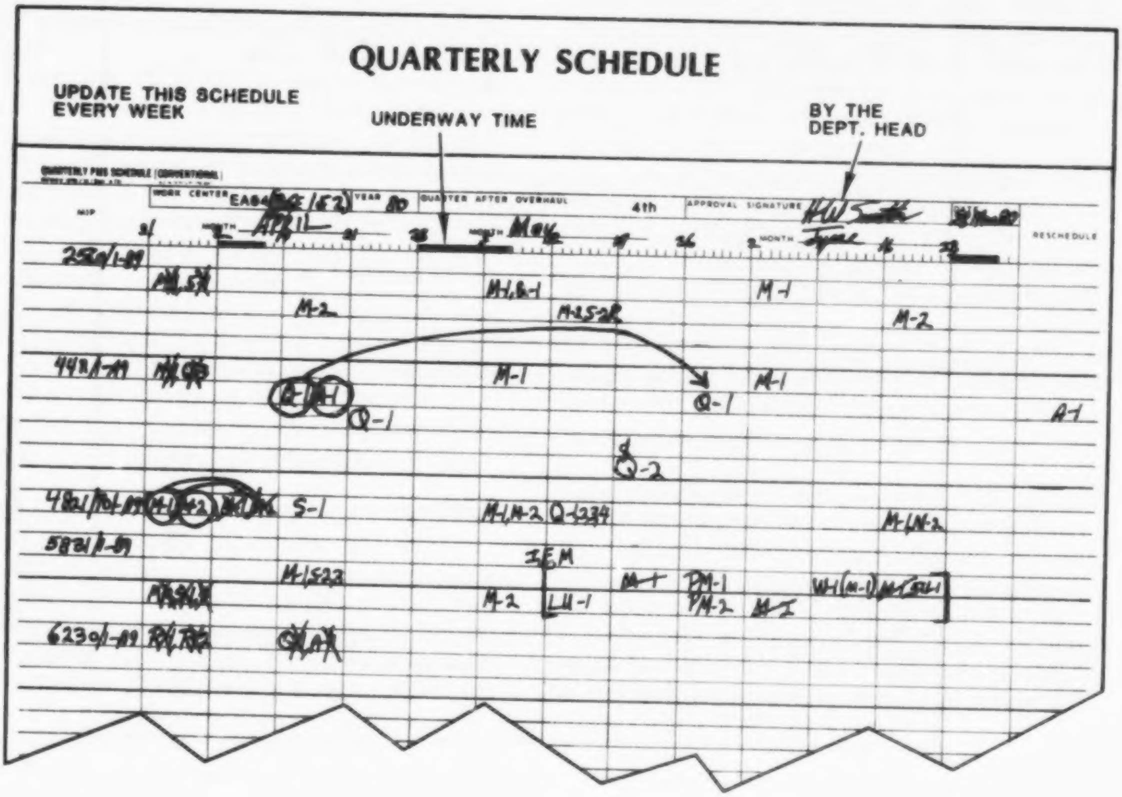
Figure 4-3.—Maintenance Requirement Card (MRC).

MRC is coded; the first part identifies the MIP, and the second part states the periodicity for the maintenance action; for example, daily, weekly, and so forth. Because of the nature of the recorded information on the MRCs, some cards will be classified. These classified cards will be printed on pink stock with the classification indicated at both the top and the bottom of each page. As required of all classified material, the MRCs must be securely handled as directed by OPNAVINST 5510.1 (Department of the Navy Information Security Program Regulation).

A master MRC deck is maintained at the departmental level, and a complete working deck is provided in the MRC holder located in each work center. Whenever a working MRC is lost, the master MRC copy can be used until a new one is received.

- PMS schedules. PMS schedules are categorized as cycle, quarterly, and weekly. The cycle PMS schedule displays the planned maintenance requirements to be performed between major overhauls. These schedules are used to plan and schedule quarterly maintenance. You, as weapons officer, should devote considerable attention to the preparation of the cycle PMS schedule. Your efforts directed towards this end will directly affect long-range scheduling. Also, sign and date the completed cycle schedule.

The quarterly PMS schedule (fig. 4-4) is a visual display of each work center's PMS requirements during a specific 3-month period. When updated weekly, this schedule provides a ready reference for the current status of the PMS for each work center. The quarterly PMS schedule is a departmental directive and may be changed only as authorized by the department head. The completed schedule must be signed in the approval signature block and dated by you, the weapons officer. When the ship's operating schedule


QUARTERLY SCHEDULE

UPDATE THIS SCHEDULE EVERY WEEK

UNDERWAY TIME

BY THE DEPT. HEAD

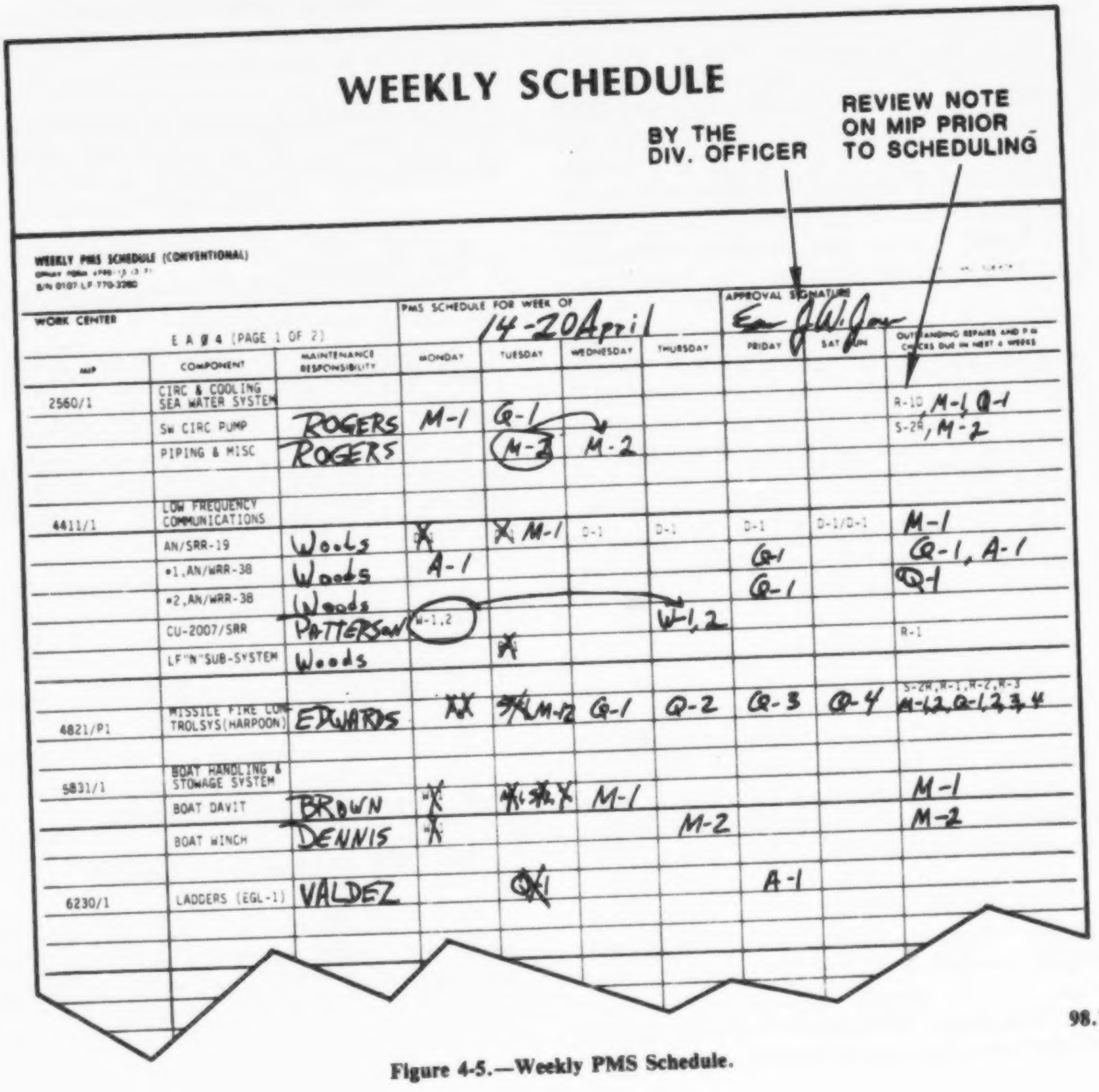
Figure 4-4.—Quarterly PMS Schedule.

63.78

changes, it is necessary to review the PMS requirements and make appropriate changes. You, as weapons officer, must indicate an awareness of maintenance actions not accomplished by signing the back of the schedule for the completed quarter. You should take positive steps to ensure that action is appropriately taken on maintenance requirements that have been rescheduled or have not been completed at the assigned interval.

The weekly PMS schedule (fig. 4-5) is a visual display of the planned maintenance scheduled for accomplishment in a given work center during a specific week. It is posted in each work center and used by the work center supervisor to assign and monitor the accomplishment of the required PMS. Information for the weekly schedule is extracted from the quarterly schedule. When the assigned maintenance has been completed, the work center supervisor crosses off the appropriate requirement.

We have only lightly touched upon the PMS requirements. For a complete description on this subject, refer to OPNAVINST 4790.4, *Ships' 3-M Manual*.



WEEKLY SCHEDULE

BY THE DIV. OFFICER

REVIEW NOTE ON MIP PRIOR TO SCHEDULING

WEEKLY PMS SCHEDULE (CONVENTIONAL)

WORK CENTER: E A 0 4 (PAGE 1 OF 2)

PMS SCHEDULE FOR WEEK OF: 14-20 April

APPROVAL SIGNATURE

MIP	COMPONENT	MAINTENANCE RESPONSIBILITY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT SUN	OUTSTANDING REPAIRS AND PM CHECKS DUE IN NEXT 4 WEEKS
2560/1	CIRC & COOLING SEA WATER SYSTEM								R-10, M-1, Q-1
	SW CIRC PUMP	ROGERS	M-1	Q-1					S-2R, M-2
	PIPING & MISC	ROGERS		M-2	M-2				
4411/1	LOW FREQUENCY COMMUNICATIONS								
	AN/SRR-19	Woods	~~D-1~~	~~D-1~~ M-1	D-1	D-1	D-1	D-1/D-1	M-1
	•1,AN/WRR-38	Woods	A-1				Q-1		Q-1, A-1
	•2,AN/WRR-38	Woods					Q-1		Q-1
	CU-2007/SRR	PATTERSON	W-1,2			W-1,2			R-1
	LF"N"SUB-SYSTEM	Woods		~~A-1~~					
									S-2R,R-1,R-2,R-3
4821/P1	MISSILE FIRE CONTROLSYS(HARPOON)	EDWARDS	[illegible]	[illegible] M-1,2	Q-1	Q-2	Q-3	Q-4	M-1,2, Q-1,2,3,4
5831/1	BOAT HANDLING & STOWAGE SYSTEM								M-1
	BOAT DAVIT	BROWN	~~W-1~~	[illegible]	M-1				M-2
	BOAT WINCH	DENNIS	~~W-1~~			M-2			
6230/1	LADDERS (EGL-1)	VALDEZ		~~Q-1~~			A-1		

98.175

Figure 4-5.—Weekly PMS Schedule.

INACTIVE EQUIPMENT MAINTENANCE (IEM).—This maintenance procedure prescribes certain reduced PMS requirements during ship overhauls and availabilities and is incorporated in the regular PMS documentation. IEM includes lay-ups, start-ups, periodic maintenance, and operational tests. IEM procedures are used during overhauls and are implemented for individual equipment whenever the equipment will be out of service for 30 days or longer.

During prolonged periods of equipment inactivity, the PMS is greatly reduced. Only that maintenance necessary to prevent the material condition of the equipment from degrading or from jeopardizing the operation of the equipment is performed.

To implement procedures for the accomplishment of the PMS on equipment declared inactive, current PMS schedules are modified to annotate the requirements listed in the IEM section of the MIP. So that advance planning and scheduling of the maintenance to be accomplished can take place, determine and identify the extent that the PMS will be applied to ship's force personnel during an inactive period. The department head is responsible for determining equipment status to meet operational commitments. The different equipment statuses are listed below:

Status I. Operational equipment that remains operative in support of required services, constant or intermittent, whether the ship is deployed, in port, or in an availability. The ship continues to schedule operational maintenance requirements for all status I equipment.

Status II. Inactive equipment remaining on board that is either not required for support services or is not classified status III.

Status III. Equipment that is directly subject to overhaul/repair in place by a shipyard or otherwise subject to removal by a shipyard for safe storage/replacement which precludes the realistic execution of routine PMS. The ship does not perform maintenance on equipment overhauled by a shipyard until the job is completed and accepted by the ship.

Maintenance actions for inactivated equipment are assigned in one of the following categories:

1. Lay-up (LU) maintenance. Lay-up maintenance actions are those necessary to prepare the equipment for periods of prolonged idleness. Lay-up maintenance actions are performed only once. If there are no lay-up actions, the word *none* will appear under the lay-up subhead on the MIP.
2. Periodic maintenance (PM). Periodic maintenance actions are those which must be accomplished on a recurring basis during the inactive period to prevent equipment deterioration.
3. Start-up (SU) maintenance. Start-up maintenance actions are those required to ensure the equipment is in a condition suitable for operation or to activate an equipment or system that has been inactivated for a prolonged period of time.
4. Operational tests (OT). These tests are conducted to determine the operational conditions of the equipment, its ability to function as designed and to be integrated with other equipment to form a system. Equipment tests are generally contained in operational PMSs and are used to the maximum extent.

The scheduling of maintenance for inactivated equipment uses conventional PMS scheduling techniques. The objectives are to—

1. continue the PMS for equipment that will remain operational,
2. prevent degradation of equipment that will not remain operational, and
3. perform no maintenance on equipment under shipyard cognizance when in restricted availability/regular overhaul (RAV/ROH).

MAINTENANCE DATA SYSTEM (MDS).—The following qualifications apply to the scope of the MDS:

1. Submarines report all maintenance actions.
2. Maintenance actions deferred for outside assistance are reported by all ships for all such maintenance actions.
3. Ship's force reports all maintenance actions on designated selected equipment.
4. All other maintenance actions as directed by fleet commander in chiefs/type commanders (CINC/TYCOMs) will be reported.

The MDS includes the following:

1. Documentation provided by shipboard personnel incident to certain shipboard maintenance actions. This documentation describes what was done or needs to be done, why it was done or needs to be done, who did it or needs to do it, and what resources were used or are needed.

2. The means of producing an automated current ship's maintenance project (CSMP).

3. The means for producing automated ship work requests for intermediate maintenance activity and shipyard use.

4. The means for producing automated preinspection and survey (PREINSURV) deficiency listings.

5. The means to produce automated reports tailored to meet the unique needs for all the various types and levels of management throughout the Navy.

6. The tools necessary to effectively manage and control intermediate maintenance activity work loads.

7. The means for the fleet to report changes to the configuration of equipment installed in ships. Incident to such reporting is the development of the capability to automatically update a ship's PMS coverage.

8. The means for depot level activities to inform the fleet of estimated and actual resource expenditures.

9. The means for managing alterations.

The MDS is the means by which maintenance personnel report corrective maintenance actions on specific categories of equipments (except for submarines which report corrective maintenance on all equipments). Information is retrievable from the type commander and the Navy Maintenance Support Office (NAMSO) data banks for analyzing maintenance and logistics support problems, for the development of the CSMP, and for the generation of automated work requests for maintenance actions deferred for outside assistance.

It is a basic premise of the MDS that the maintenance data will be recorded only once by fleet personnel and that the MDS data bank (not the maintenance activity) will thereafter provide information to all who have need for it and in such form as may be required. In this connection, the NAMSO data bank is designed to be the focal point for receipt and distribution of maintenance and material data. Direct requests to the fleet for data which is available from the NAMSO imposes an unnecessary burden on the operating forces.

The usefulness of the MDS depends on the accuracy, adequacy, and timeliness of the information reported into the system. It is a system in which potential benefits are directly proportional to the efforts applied. Present programs for improving reliability, maintainability, and logistics support of fleet equipment are dependent upon conscientious adherence to reporting procedures.

Much of the fleet support effort resulting from use of 3-M Systems data is not always visible immediately to the fleet because of the time span required to test, evaluate, and implement the engineering and design changes. Correction of malfunctioning equipment, through improvement in design, often occurs subsequent to reassignment of personnel who provided the information that brought about the corrective action.

ALTERATION MANAGEMENT SYSTEM (AMS).—The AMS consists of administrative procedures, an automated data processing system, and a series of AMS reports. This system assists the type commander in fulfilling responsibilities toward monitoring and controlling the configuration of attached units and in satisfying the requirements of the fleet modernization program (FMP). Using a combination of the MDS and AMS administrative procedures, the type commander is able to direct the accomplishment of alterations, assign priorities, and monitor the progress of alterations throughout the force. In support of the FMP, the AMS computer programs produce reports of the alteration in convenient formats so the type commander may properly advise the Chief of Naval Operations (CNO) concerning the structure of FMP.

- Administrative Procedures

Periodically, the Naval Sea Systems Command (NAVSEASYSCOM) forwards alteration documents and data, which interfaces with both the MDS and AMS, to the type commanders. This information, pertaining to NAVSEASYSCOM controlled alterations, is entered into a type commander AMS master file. Prior to forwarding this information to the attached units, the type commander will review and modify the data as necessary. Information pertaining to alterations issued by the type commander is documented and entered into the AMS master file.

The type commander may request reports and modify the data as desired so that the reports correctly reflect the type commander's recommendations for changing the FMP.

- Data Processing System

The ships' 3-M computer programs are designed to accept applicable data to file, sort, and display. The AMS interfaces with the MDS so alteration information is automatically passed from the MDS to the AMS. Similarly, the MDS information entered into the AMS may be transferred to a ship's CSMP.

This system supplies the communication link between the NAVSEASYSCOM ships alteration management information system (SAMIS) and the unit's CSMP file, with the type commander in positive control of the information.

- Reports

The three series of reports that are described below are tailored to the needs of the type commander, the intermediate unit commanders (IUCs), and the ship.

1. Matrices that display alteration information and the applicability code for a multiple number of ships. These are specifically designed to summarize force or squadron alteration status for the type commander and the IUCs.
2. Reports that detail the status of alterations for each ship.
3. Reports that display alterations and the assigned priority for analysis and information of the type commander, and for use in entering changes to the priority assignments.

INTERMEDIATE MAINTENANCE MANAGEMENT SYSTEM (IMMS).—This system is comprised of computerized procedures used aboard tenders, repair ships, and repair bases/activities. These mechanized procedures are used to manage the planning, scheduling, production, and monitoring of the maintenance work loads of tended ships and repair bases/activities.

The IMMS consists of computer programs and the administrative procedures which do the following:

1. Allow the processing of MDS documentation and the production of standard automated CSMP files for supported units.
2. Provide for the maintenance of the master CSMP files for supported units.
3. Provide management tools for the planning, estimating, and progressing of work done by the intermediate maintenance activity (IMA).
4. Maintain a master job catalog (MJC) (a listing of work of a repetitive nature).
5. Create reports used by higher authority to evaluate the performance of IMAs.

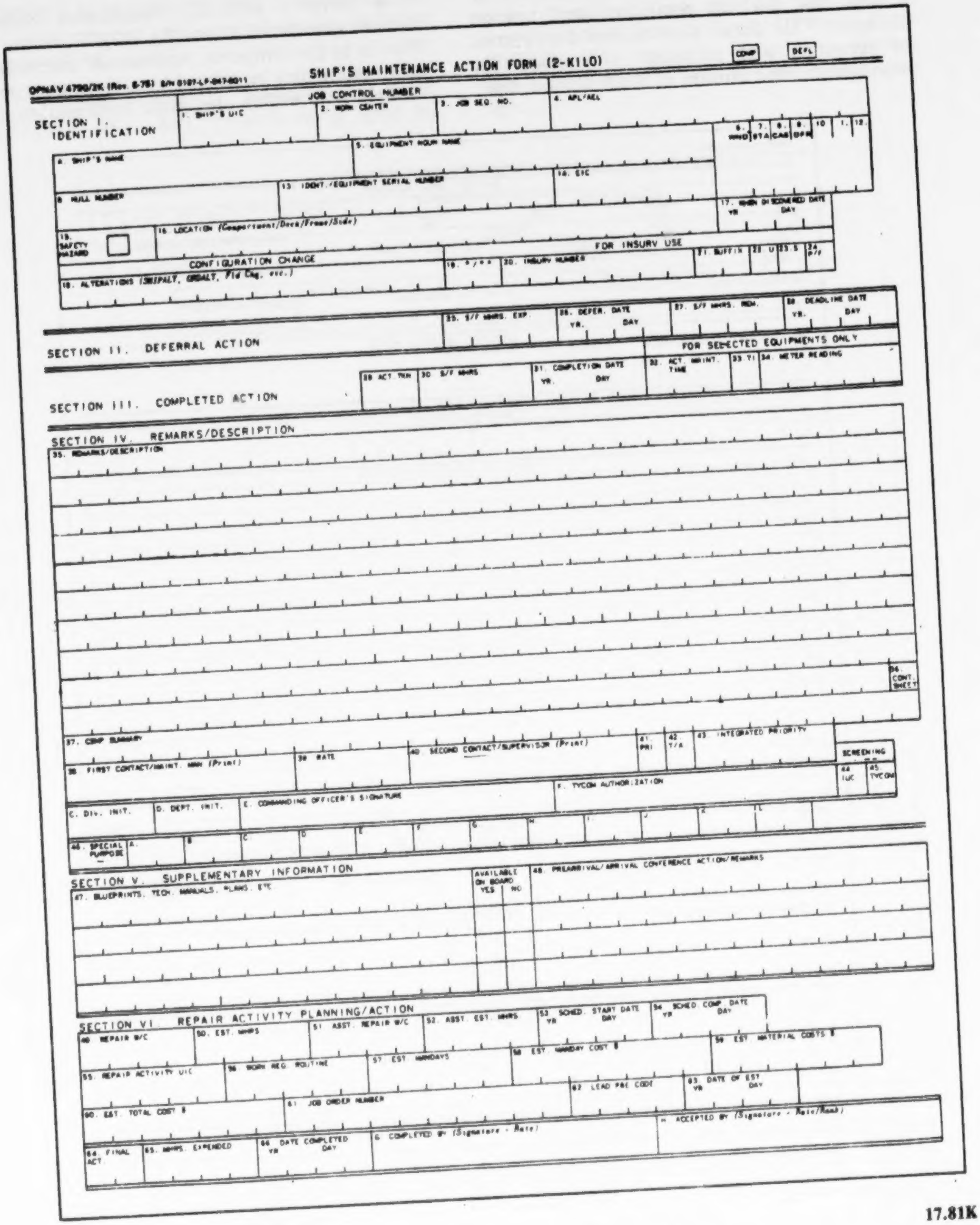
The IMMS is a collection of management tools. It is a system that has been successfully working for some time, and this experience has shown that the benefits derived are directly related to the accuracy of input documentation and the use made of the IMMS by supervisors. Through proper use of the IMMS, type commanders and IMAs have been able to plan a ship's availability more than 4 weeks in advance of its availability, thereby increasing the efficient use of IMA resources.

The IMMS accepts MDS documentation and, through a central document processing center, the Maintenance Document Control Office (MDCO), provides for processing these documents for insertion of the deficiencies they describe into a tended unit's master CSMP file. The MDCO directly supports a representative of the type commander (TYCOM Rep). A repair-oriented central processing point, the Analysis Records and Reports Section (ARRS), within the repair organization of an IMA directly supports the repair officer.

From the CSMP file, the IMMS produces automated CSMP reports in support of the repair organization. The IMMS depends on accurate documentation of each individual and the subsequent attention given to this documentation by his or her supervisors. Safeguards exist to ensure documents submitted will actually be entered into the ship's master CSMP file.

MDS Forms.—The following forms are used to report information into the MDS (their detailed description and use are described in OPNAVINST 4790.4):

- OPNAV 4790/2K, Ship's Maintenance Action Form (fig. 4-6). This form is used by maintenance personnel to report deferred



COMP
DEFL

SHIP'S MAINTENANCE ACTION FORM (2-KILO)

OPNAV 4790/2K (Rev. 6-75) S/N 0107-LF-047-6011

SECTION I. IDENTIFICATION

JOB CONTROL NUMBER
1. SHIP'S UIC
2. WORK CENTER
3. JOB SEQ. NO.
4. APL/AEL
5. EQUIPMENT NOUN NAME
6. WHD
7. STA
8. CAS
9. DFR
10
11
12
A. SHIP'S NAME
B. HULL NUMBER
13. IDENT./EQUIPMENT SERIAL NUMBER
14. EIC
15. SAFETY HAZARD ☐
16. LOCATION (Compartment/Deck/Frame/Side)
17. WHEN DISCOVERED DATE YR DAY
CONFIGURATION CHANGE
18. ALTERATIONS (SHIPALT, ORDALT, Fld Chg, etc.)
FOR INSURV USE
19. */**
20. INSURV NUMBER
21. SUFFIX
22. U
23. S
24. P/F

SECTION II. DEFERRAL ACTION

25. S/F MHRS. EXP.
26. DEFER. DATE YR. DAY
27. S/F MHRS. REM.
28. DEADLINE DATE YR. DAY

SECTION III. COMPLETED ACTION

29. ACT. TKN
30. S/F MHRS
31. COMPLETION DATE YR. DAY
FOR SELECTED EQUIPMENTS ONLY
32. ACT. MAINT. TIME
33. TI
34. METER READING

SECTION IV. REMARKS/DESCRIPTION

35. REMARKS/DESCRIPTION
36. CONT. SHEET
37. CSMP SUMMARY
38. FIRST CONTACT/MAINT. MAN (Print)
39. RATE
40. SECOND CONTACT/SUPERVISOR (Print)
41. PRI
42. T/A
43. INTEGRATED PRIORITY
SCREENING
44. IUC
45. TYCOM
C. DIV. INIT.
D. DEPT. INIT.
E. COMMANDING OFFICER'S SIGNATURE
F. TYCOM AUTHORIZATION
46. SPECIAL PURPOSE
A.
B
C
D
E
F
G
H
I
J
K
L

SECTION V. SUPPLEMENTARY INFORMATION

47. BLUEPRINTS, TECH. MANUALS, PLANS, ETC
AVAILABLE ON BOARD YES NO
48. PREARRIVAL/ARRIVAL CONFERENCE ACTION/REMARKS

SECTION VI. REPAIR ACTIVITY PLANNING/ACTION

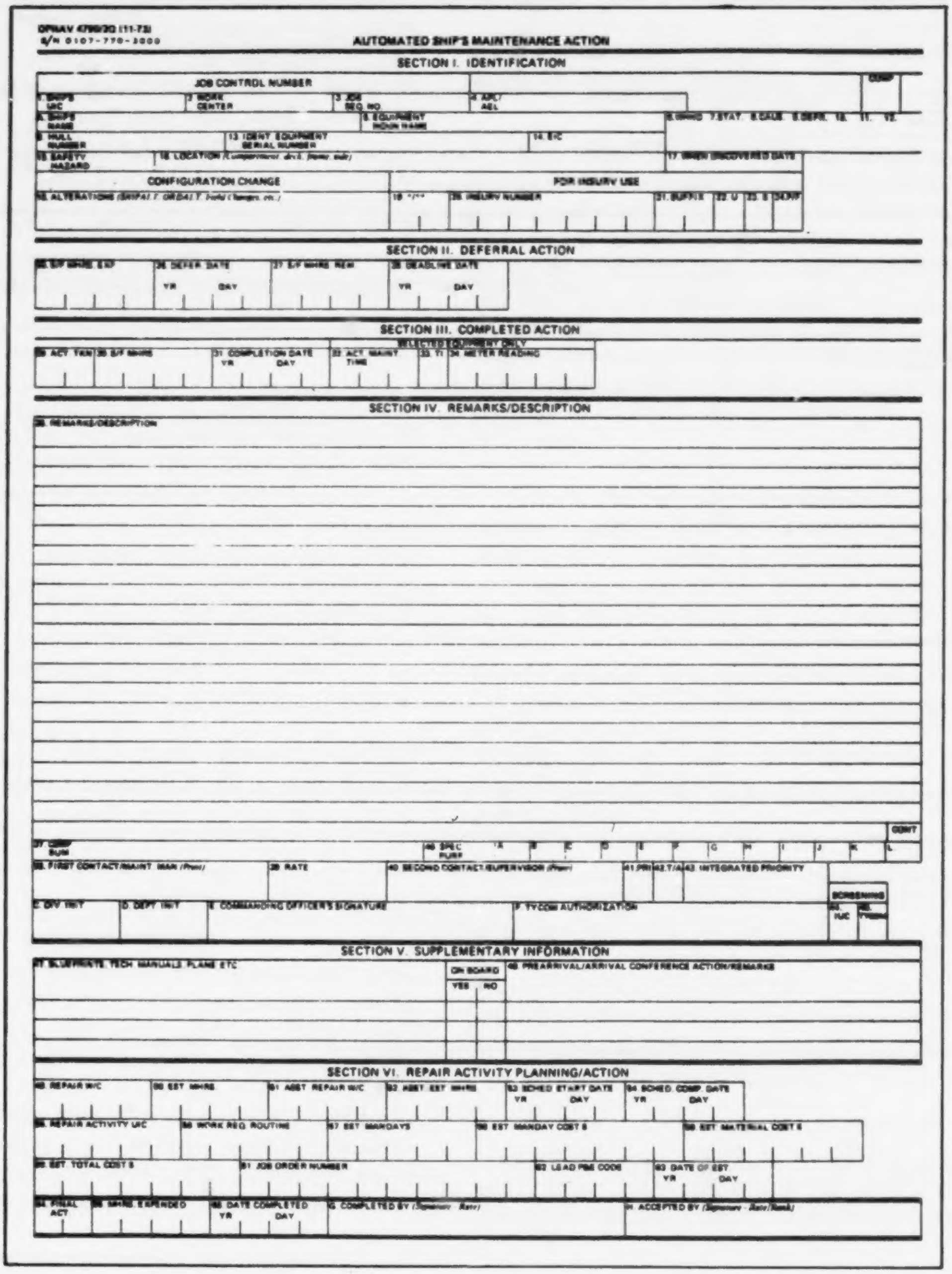
49. REPAIR W/C
50. EST. MHRS
51. ASST. REPAIR W/C
52. ASST. EST. MHRS
53. SCHED. START DATE YR DAY
54. SCHED COMP. DATE YR DAY
55. REPAIR ACTIVITY UIC
56. WORK REQ. ROUTINE
57. EST. MANDAYS
58. EST. MANDAY COST $
59. EST. MATERIAL COSTS $
60. EST. TOTAL COST $
61. JOB ORDER NUMBER
62. LEAD PAE CODE
63. DATE OF EST YR DAY
G. COMPLETED BY (Signature - Rate)
H. ACCEPTED BY (Signature - Rate/Rank)
64. FINAL ACT.
65. MHRS. EXPENDED
66. DATE COMPLETED YR DAY

17.81K

Figure 4-6.—OPNAV 4790/2K, Ship's Maintenance Action Form.

maintenance actions and completed maintenance actions that do not result in configuration changes. This form also allows for entries of screening and planning information for management and control of IMA work loads.

- OPNAV 4790/2Q, Automated Ship's Maintenance Action Form (fig. 4-7). This form is filled in by the computer. Additional handwritten information may be entered by maintenance personnel. It contains the same information as



OPNAV 4790/2Q (11-73)
S/N 0107-770-3000

AUTOMATED SHIP'S MAINTENANCE ACTION

SECTION I. IDENTIFICATION

JOB CONTROL NUMBER
COMP
1. SHIP'S UIC
2. WORK CENTER
3. JOB SEQ NO
4. APL/AEL
5. SHIP'S NAME
6. EQUIPMENT NOUN NAME
6. WHD 7. STAT 8. CAUS 9. DEFR 10. 11. 12.
9. HULL NUMBER
13. IDENT EQUIPMENT SERIAL NUMBER
14. EIC
15. SAFETY HAZARD
16. LOCATION (Compartment, deck, frame, side)
17. WHEN DISCOVERED DATE
CONFIGURATION CHANGE
18. ALTERATIONS (SHIPALT, ORDALT, field changes, etc.)
FOR INSURV USE
19. "/"*
20. INSURV NUMBER
21. SUFFIX
22. U
23. S
24. [illegible]

SECTION II. DEFERRAL ACTION

25. S/F MHRS EST
26. DEFER DATE YR DAY
27. S/F MHRS REM
28. DEADLINE DATE YR DAY

SECTION III. COMPLETED ACTION

SELECTED EQUIPMENT ONLY
29. ACT TKN
30. S/F MHRS
31. COMPLETION DATE YR DAY
32. ACT MAINT TIME
33. TI
34. METER READING

SECTION IV. REMARKS/DESCRIPTION

35. REMARKS/DESCRIPTION
CONT
37. COMP SUM
46. SPEC PURP A B C D E F G H I J K L
38. FIRST CONTACT/MAINT MAN (Print)
39. RATE
40. SECOND CONTACT/SUPERVISOR (Print)
41. PRI
42. T/A
43. INTEGRATED PRIORITY
C. DIV INIT
D. DEPT INIT
E. COMMANDING OFFICER'S SIGNATURE
F. TYCOM AUTHORIZATION
SCREENING
44. IUC
45. [illegible]

SECTION V. SUPPLEMENTARY INFORMATION

47. BLUEPRINTS, TECH MANUALS, PLANS ETC
ON BOARD YES NO
48. PREARRIVAL/ARRIVAL CONFERENCE ACTION/REMARKS

SECTION VI. REPAIR ACTIVITY PLANNING/ACTION

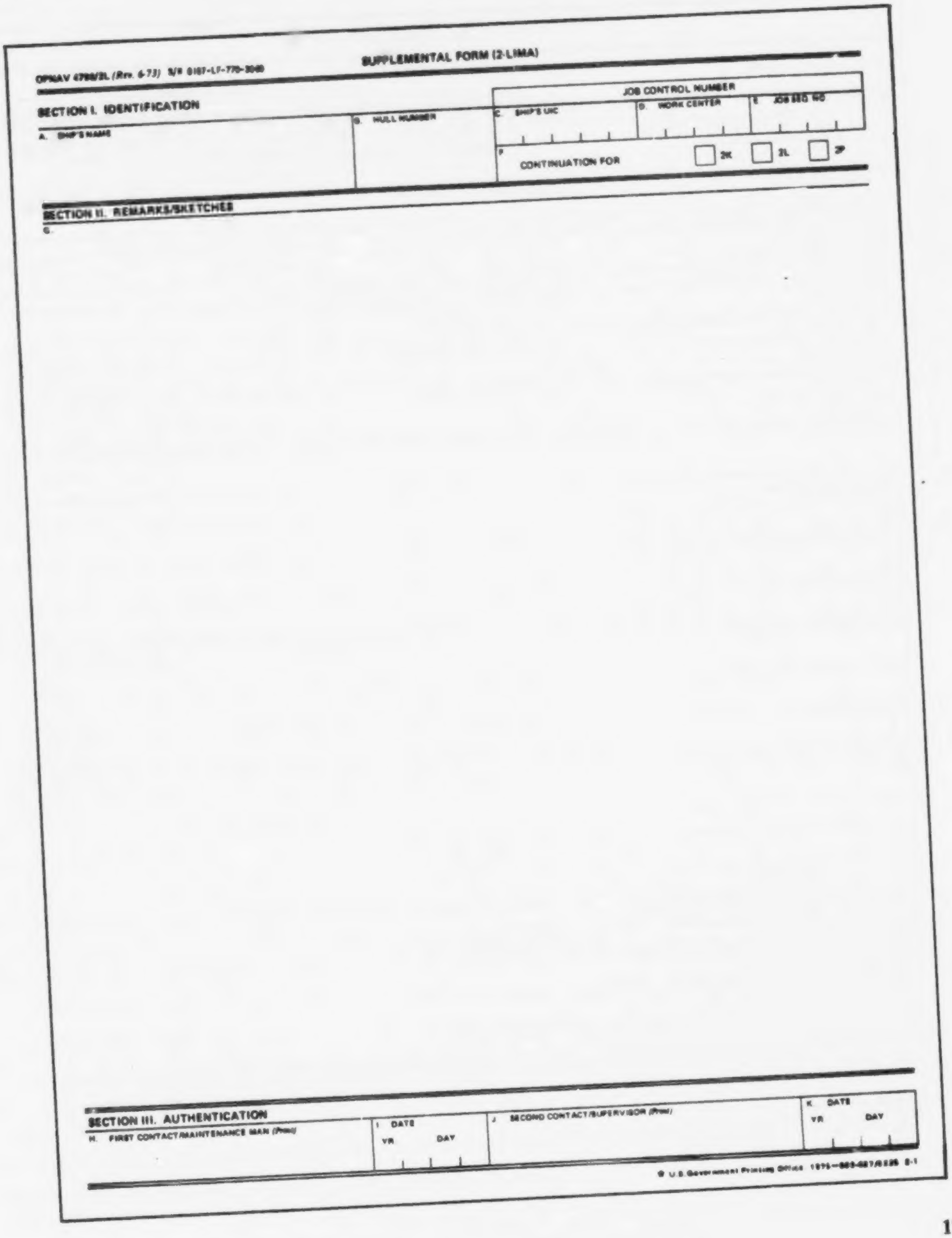
49. REPAIR W/C
50. EST MHRS
51. ASST REPAIR W/C
52. ASST EST MHRS
53. SCHED START DATE YR DAY
54. SCHED COMP DATE YR DAY
55. REPAIR ACTIVITY UIC
56. WORK REQ ROUTINE
57. EST MANDAYS
58. EST MANDAY COST $
59. EST MATERIAL COST $
60. EST TOTAL COST $
61. JOB ORDER NUMBER
62. LEAD PAE CODE
63. DATE OF EST YR DAY
64. FINAL ACT
65. MHRS EXPENDED
66. DATE COMPLETED YR DAY
G. COMPLETED BY (Signature - Rate)
H. ACCEPTED BY (Signature - Rate/Rank)

63.79

Figure 4-7.—OPNAV 4790/2Q, Automated Ship's Maintenance Action Form.

OPNAV Form 4790/2K. This form may be used as an automated work request and for INSURV preparation.

- OPNAV 4790/2L, Supplemental Form (2-LIMA) (fig. 4-8). This form is used by maintenance personnel to provide any amplifying information relating to a maintenance action reported on OPNAV Form 4790/2K (for example, drawings, listings, and so forth) for use by the repair activity.



OPNAV 4790/2L *(Rev. 6-73)* S/N 0107-LF-770-3040

SUPPLEMENTAL FORM (2-LIMA)

SECTION I. IDENTIFICATION

A. SHIP'S NAME

B. HULL NUMBER

JOB CONTROL NUMBER

C. SHIP'S UIC

D. WORK CENTER

E. JOB SEQ NO

F. CONTINUATION FOR ☐ 2K ☐ 2L ☐ 2P

SECTION II. REMARKS/SKETCHES

G.

SECTION III. AUTHENTICATION

H. FIRST CONTACT/MAINTENANCE MAN *(Print)*

I. DATE YR DAY

J. SECOND CONTACT/SUPERVISOR *(Print)*

K. DATE YR DAY

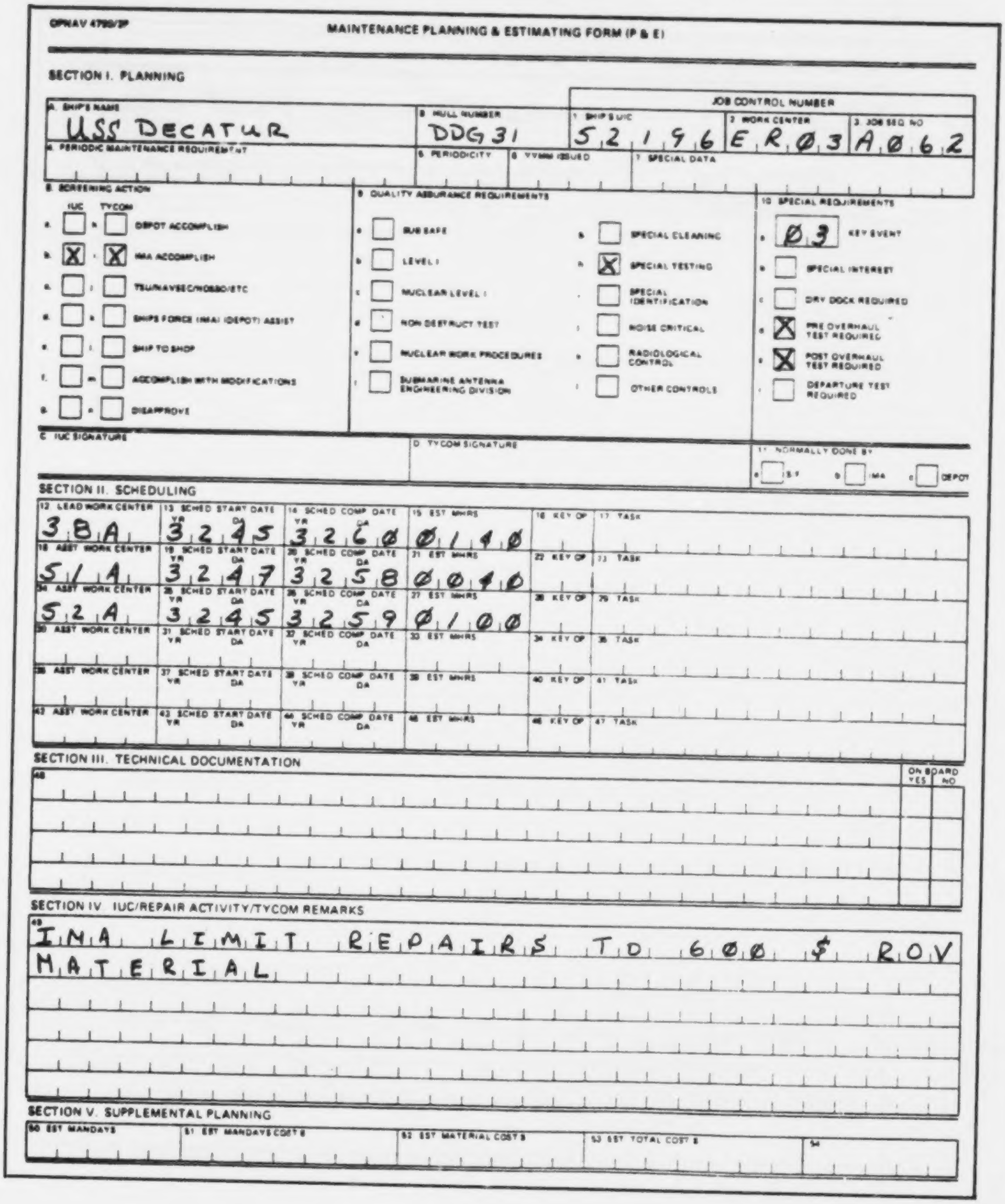
U.S. Government Printing Office

17.81L

Figure 4-8.—OPNAV 4790/2L, Supplemental Form.

- OPNAV 4790/2P, Maintenance Planning and Estimating Form (fig. 4-9). This form is used with OPNAV Form 4790/2K when deferring maintenance to be accomplished by an IMA under IMMS. The form is designed so that screening and planning may be done in detail to include material requirements, technical documentations, and cost estimates.

- OPNAV 4790/2R, Automated Work Request (AWR) (fig. 4-10). This form combines the information from OPNAV forms 4790/2K



OPNAV 4790/2P

MAINTENANCE PLANNING & ESTIMATING FORM (P & E)

SECTION I. PLANNING

JOB CONTROL NUMBER

A. SHIP'S NAME: USS DECATUR
B. HULL NUMBER: DDG 31
1. SHIP'S UIC: 52196
2. WORK CENTER: ER03
3. JOB SEQ NO: A062
4. PERIODIC MAINTENANCE REQUIREMENT:
5. PERIODICITY:
6. YYMM ISSUED:
7. SPECIAL DATA:

8. SCREENING ACTION

IUC / TYCOM
a. ☐ h. ☐ DEPOT ACCOMPLISH
b. ☒ i. ☒ IMA ACCOMPLISH
c. ☐ j. ☐ TSU/NAVSEC/NOSSO/ETC
d. ☐ k. ☐ SHIPS FORCE (IMA) (DEPOT) ASSIST
e. ☐ l. ☐ SHIP TO SHOP
f. ☐ m. ☐ ACCOMPLISH WITH MODIFICATIONS
g. ☐ n. ☐ DISAPPROVE

9. QUALITY ASSURANCE REQUIREMENTS
a. ☐ SUB SAFE
b. ☐ LEVEL I
c. ☐ NUCLEAR LEVEL I
d. ☐ NON DESTRUCT TEST
e. ☐ NUCLEAR WORK PROCEDURES
f. ☐ SUBMARINE ANTENNA ENGINEERING DIVISION
g. ☐ SPECIAL CLEANING
h. ☒ SPECIAL TESTING
i. ☐ SPECIAL IDENTIFICATION
j. ☐ NOISE CRITICAL
k. ☐ RADIOLOGICAL CONTROL
l. ☐ OTHER CONTROLS

10. SPECIAL REQUIREMENTS
a. 03 KEY EVENT
b. ☐ SPECIAL INTEREST
c. ☐ DRY DOCK REQUIRED
d. ☒ PRE OVERHAUL TEST REQUIRED
e. ☒ POST OVERHAUL TEST REQUIRED
f. ☐ DEPARTURE TEST REQUIRED

C. IUC SIGNATURE:
D. TYCOM SIGNATURE:
11. NORMALLY DONE BY: a. ☐ S/F b. ☐ IMA c. ☐ DEPOT

SECTION II. SCHEDULING

12 LEAD WORK CENTER 38A	13 SCHED START DATE YR DA 3245	14 SCHED COMP DATE YR DA 3260	15 EST MHRS 0140	16 KEY OP	17 TASK
18 ASST WORK CENTER 51A	19 SCHED START DATE YR DA 3247	20 SCHED COMP DATE YR DA 3258	21 EST MHRS 0040	22 KEY OP	23 TASK
24 ASST WORK CENTER 52A	25 SCHED START DATE YR DA 3245	26 SCHED COMP DATE YR DA 3259	27 EST MHRS 0100	28 KEY OP	29 TASK
30 ASST WORK CENTER	31 SCHED START DATE YR DA	32 SCHED COMP DATE YR DA	33 EST MHRS	34 KEY OP	35 TASK
36 ASST WORK CENTER	37 SCHED START DATE YR DA	38 SCHED COMP DATE YR DA	39 EST MHRS	40 KEY OP	41 TASK
42 ASST WORK CENTER	43 SCHED START DATE YR DA	44 SCHED COMP DATE YR DA	45 EST MHRS	46 KEY OP	47 TASK

SECTION III. TECHNICAL DOCUMENTATION

48

ON BOARD YES NO

SECTION IV. IUC/REPAIR ACTIVITY/TYCOM REMARKS

49 IMA LIMIT REPAIRS TO 600 $ ROV MATERIAL

SECTION V. SUPPLEMENTAL PLANNING

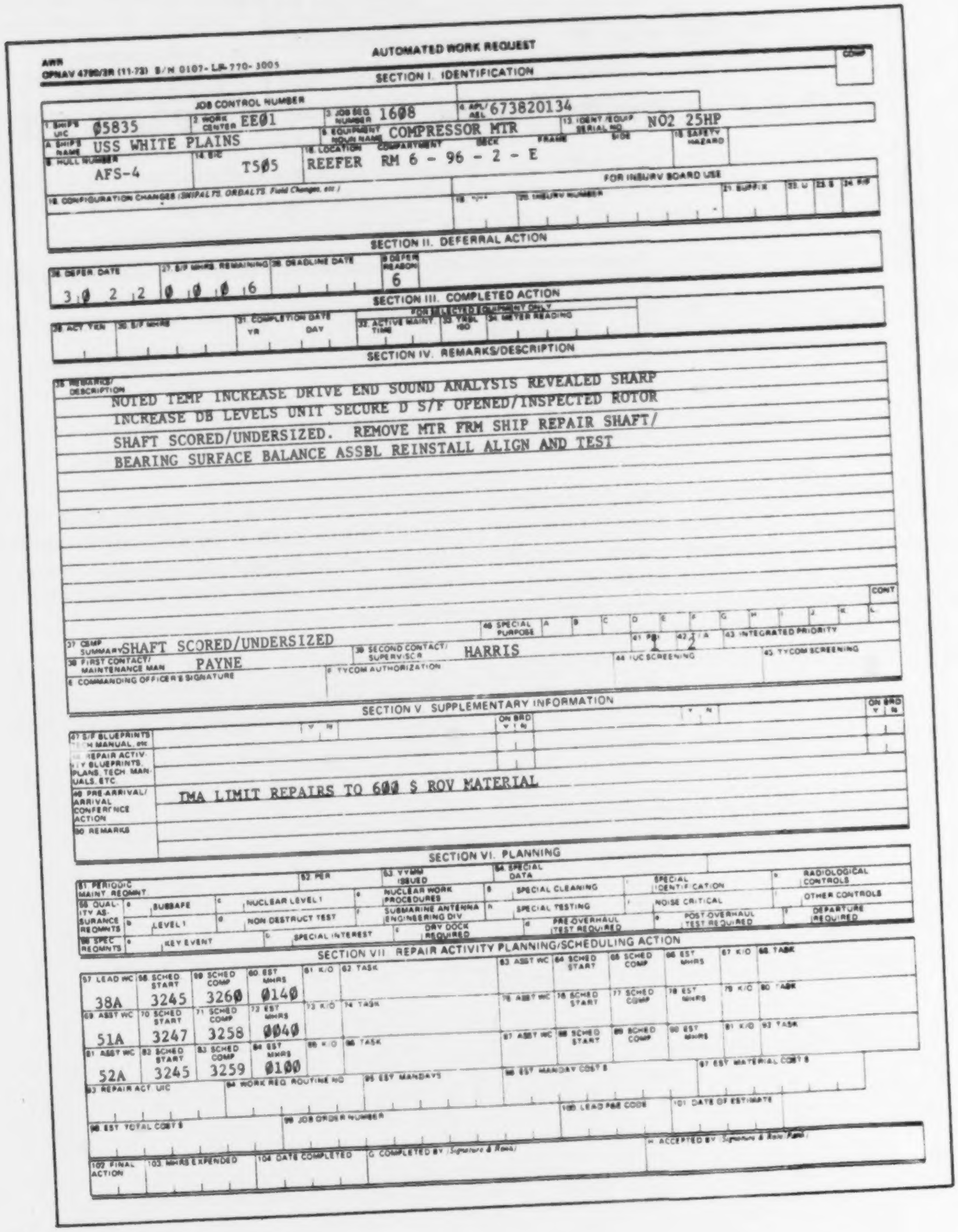
50 EST MANDAYS
51 EST MANDAYS COST $
52 EST MATERIAL COST $
53 EST TOTAL COST $
54

63.80

Figure 4-9.—OPNAV 4790/2P, Maintenance Planning and Estimating Form.

and 4790/2P, and is available in four copies. The AWR form has been designed for machine- and hand-printed entries. It can be used as a/an

1. automated work request
2. automatic data processing (ADP) produced work control document for internal IMA use
3. item from the MJC
4. configuration change report
5. preparation for INSURV



AWR
OPNAV 4790/2R (11-73) S/N 0107-LF-770-3005

AUTOMATED WORK REQUEST

COMP

SECTION I. IDENTIFICATION

JOB CONTROL NUMBER
1. SHIPS UIC 05835
2. WORK CENTER EE01
3. JOB SEQ NUMBER 1608
4. APL/AEL 673820134
4. SHIPS NAME USS WHITE PLAINS
5. HULL NUMBER AFS-4
6. EQUIPMENT NOUN NAME COMPRESSOR MTR
13. IDENT/EQUIP SERIAL NO. NO2 25HP
14. EIC T505
15. SAFETY HAZARD
16. LOCATION COMPARTMENT DECK FRAME SIDE REEFER RM 6 - 96 - 2 - E
18. CONFIGURATION CHANGES (SHIPALTS, ORDALTS, Field Changes, etc.)
FOR INSURV BOARD USE
20. INSURV NUMBER
21. SUFFIX

SECTION II. DEFERRAL ACTION

26. DEFER DATE 3 0 2 2
27. S/F MHRS. REMAINING 0 0 0 6
28. DEADLINE DATE
DEFER REASON 6

SECTION III. COMPLETED ACTION

29. ACT YEN
30. S/F MHRS
31. COMPLETION DATE YR DAY
FOR SELECTED EQUIPMENT ONLY
32. ACTIVE MAINT. TIME
33. YRSL 180
34. METER READING

SECTION IV. REMARKS/DESCRIPTION

35. REMARKS/DESCRIPTION
NOTED TEMP INCREASE DRIVE END SOUND ANALYSIS REVEALED SHARP
INCREASE DB LEVELS UNIT SECURE D S/F OPENED/INSPECTED ROTOR
SHAFT SCORED/UNDERSIZED. REMOVE MTR FRM SHIP REPAIR SHAFT/
BEARING SURFACE BALANCE ASSBL REINSTALL ALIGN AND TEST

CONT

40. SPECIAL PURPOSE A B C D E F G H I J K L
37. CSMP SUMMARY SHAFT SCORED/UNDERSIZED
38. FIRST CONTACT/MAINTENANCE MAN PAYNE
39. SECOND CONTACT/SUPERVISOR HARRIS
41. PRI 1
42. T/A 2
43. INTEGRATED PRIORITY
44. IUC SCREENING
45. TYCOM SCREENING
E. COMMANDING OFFICER'S SIGNATURE
F. TYCOM AUTHORIZATION

SECTION V. SUPPLEMENTARY INFORMATION

47. S/F BLUEPRINTS, TECH MANUAL, etc. Y N ON BRD Y N
48. REPAIR ACTIVITY BLUEPRINTS, PLANS, TECH MANUALS, ETC.
49. PRE-ARRIVAL/ARRIVAL CONFERENCE ACTION IMA LIMIT REPAIRS TO 600 $ ROV MATERIAL
50. REMARKS

SECTION VI. PLANNING

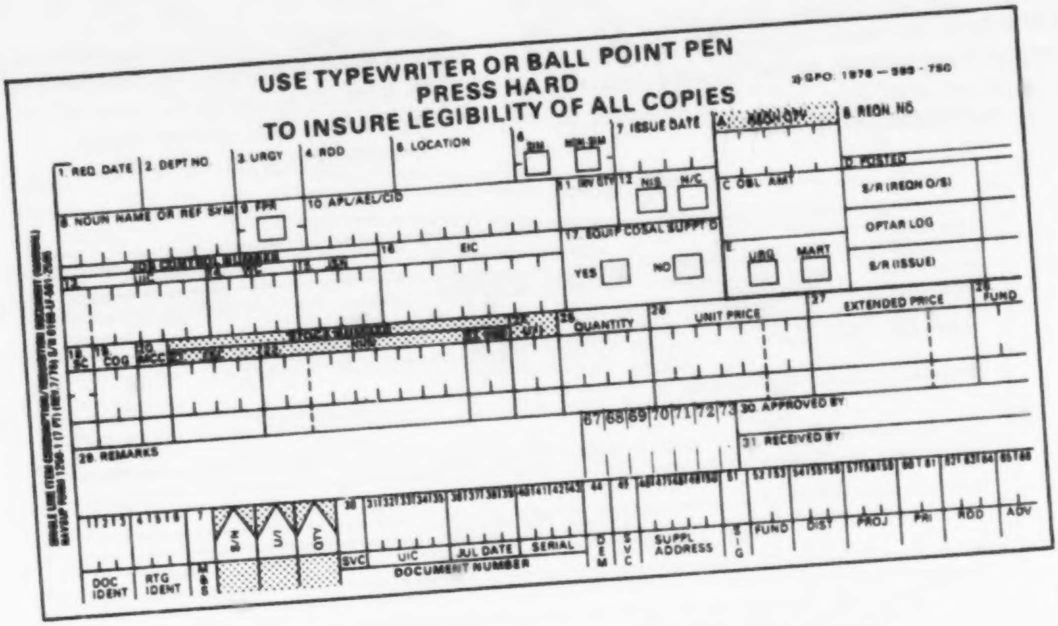
51. PERIODIC MAINT. REQMNT.
52. PER
53. YYMM ISSUED
54. SPECIAL DATA
55. QUALITY ASSURANCE REQMNTS a SUBSAFE b LEVEL I c NUCLEAR LEVEL I d NON DESTRUCT TEST e NUCLEAR WORK PROCEDURES f SUBMARINE ANTENNA ENGINEERING DIV g SPECIAL CLEANING h SPECIAL TESTING i SPECIAL IDENTIFICATION j NOISE CRITICAL k RADIOLOGICAL CONTROLS l OTHER CONTROLS
56. SPEC REQMNTS a KEY EVENT b SPECIAL INTEREST c DRY DOCK REQUIRED d PRE-OVERHAUL TEST REQUIRED e POST-OVERHAUL TEST REQUIRED f DEPARTURE REQUIRED

SECTION VII. REPAIR ACTIVITY PLANNING/SCHEDULING ACTION

57. LEAD WC 38A
58. SCHED START 3245
59. SCHED COMP 3260
60. EST MHRS 0140
61. K/O
62. TASK
63. ASST WC
64. SCHED START
65. SCHED COMP
66. EST MHRS
67. K/O
68. TASK
69. ASST WC 51A
70. SCHED START 3247
71. SCHED COMP 3258
72. EST MHRS 0040
73. K/O
74. TASK
75. ASST WC
76. SCHED START
77. SCHED COMP
78. EST MHRS
79. K/O
80. TASK
81. ASST WC 52A
82. SCHED START 3245
83. SCHED COMP 3259
84. EST MHRS 0100
85. K/O
86. TASK
87. ASST WC
88. SCHED START
89. SCHED COMP
90. EST MHRS
91. K/O
92. TASK
93. REPAIR ACT. UIC
94. WORK REQ. ROUTINE NO.
95. EST. MANDAYS
96. EST. MANDAY COST $
97. EST. MATERIAL COST $
98. EST. TOTAL COST $
99. JOB ORDER NUMBER
100. LEAD P&E CODE
101. DATE OF ESTIMATE
102. FINAL ACTION
103. MHRS EXPENDED
104. DATE COMPLETED
G. COMPLETED BY (Signature & Rate)
H. ACCEPTED BY (Signature & Rate/Rank)

63.81

Figure 4-10.—OPNAV 4790/2R, Automated Work Request (AWR).


USE TYPEWRITER OR BALL POINT PEN
PRESS HARD
TO INSURE LEGIBILITY OF ALL COPIES
1 REQ DATE
2 DEPT NO
3 URGY
4 RDD
5 LOCATION
7 ISSUE DATE
9 REQN NO
D POSTED
C OBL AMT
S/R (REQN O/S)
OPTAR LOG
S/R (ISSUE)
10 APL/AEL/CID
EIC
17 EQUIP COSAL SUPPT'D
YES
NO
QUANTITY
UNIT PRICE
EXTENDED PRICE
FUND
COG
30 APPROVED BY
31 RECEIVED BY
29 REMARKS
DOC IDENT
RTG IDENT
UIC
JUL DATE
SERIAL
DOCUMENT NUMBER
SUPPL ADDRESS
FUND
DIST
PROJ
PRI
RDD
ADV

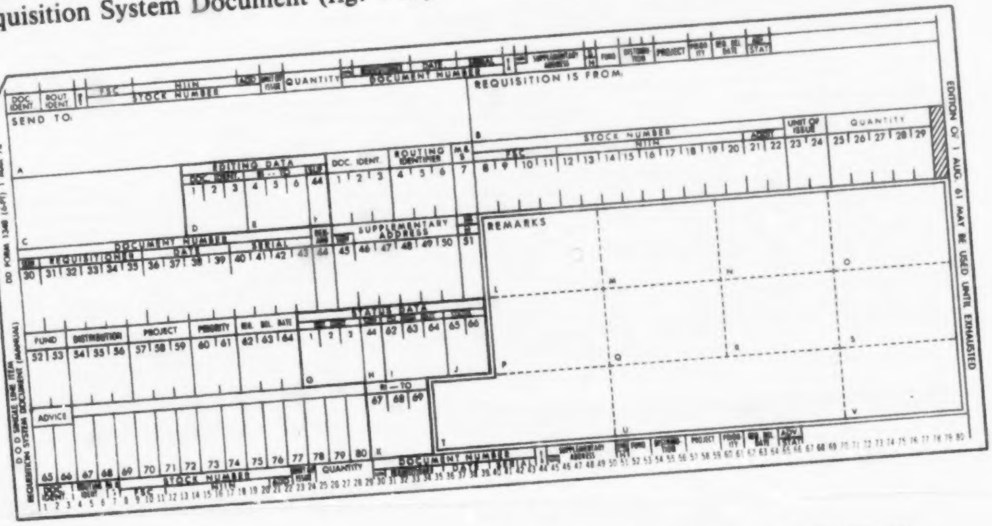
17.84

Figure 4-11.—NAVSUP Form 1250-1, Internal Ship Supply Document.

- NAVSUP Form 1250-1, Internal Ship Supply Document (fig. 4-11). This form is used on ships without a computer-aided (automated) supply management system on board. It is used to request parts to complete any maintenance action. Both supply department and maintenance personnel enter appropriate information on this form.

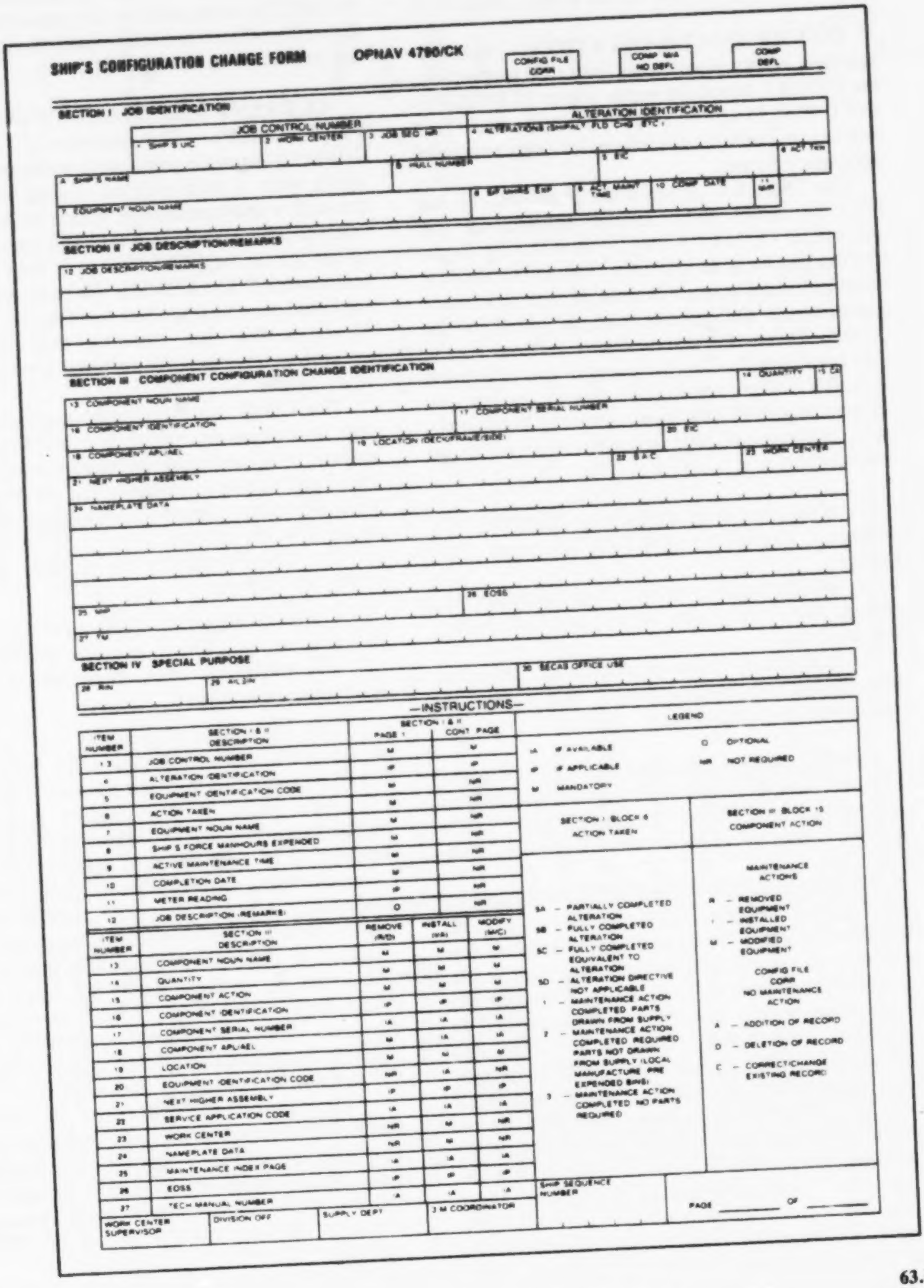
- DD Form 1348, DOD Single Line Item Requisition System Document (fig. 4-12). This form is used by maintenance personnel on ships having a computer-aided (automated) supply management system on board. It is used in the same way as NAVSUP Form 1250-1.

- OPNAV 4790/CK, Ship's Configuration Change Form (fig. 4-13). This form is used to report any maintenance action that results in a configuration change.


SEND TO:
REQUISITION IS FROM
STOCK NUMBER
QUANTITY
UNIT OF ISSUE
DOCUMENT NUMBER
SERIAL
SUPPLEMENTARY ADDRESS
REMARKS
FUND
DISTRIBUTION
PROJECT
PRIORITY
ADVICE
EDITION OF 1 AUG. 61 MAY BE USED UNTIL EXHAUSTED

43.24

Figure 4-12.—DD Form 1348, DOD Single Line Item Requisition System Document.



SHIP'S CONFIGURATION CHANGE FORM **OPNAV 4790/CK**

CONFIG FILE CORR | COMP M/A NO DEFL | COMP DEFL

SECTION I JOB IDENTIFICATION

JOB CONTROL NUMBER
1 SHIP'S UIC
2 WORK CENTER
3 JOB SEQ NR

ALTERATION IDENTIFICATION
4 ALTERATIONS (SHIPALT FLD CHG ETC.)
5 EIC
6 ACT TKN

A SHIP'S NAME
B HULL NUMBER
7 EQUIPMENT NOUN NAME
8 SF MHRS EXP
9 ACT MAINT TIME
10 COMP DATE
11 MTR

SECTION II JOB DESCRIPTION/REMARKS

12 JOB DESCRIPTION/REMARKS

SECTION III COMPONENT CONFIGURATION CHANGE IDENTIFICATION

14 QUANTITY
15 CA
13 COMPONENT NOUN NAME
17 COMPONENT SERIAL NUMBER
16 COMPONENT IDENTIFICATION
20 EIC
19 LOCATION (DECK/FRAME/SIDE)
18 COMPONENT APL/AEL
22 SAC
23 WORK CENTER
21 NEXT HIGHER ASSEMBLY
24 NAMEPLATE DATA
26 EOSS
25 MIP
27 TM

SECTION IV SPECIAL PURPOSE

30 SECAS OFFICE USE
28 RIN
29 AIL DIN

—INSTRUCTIONS—

ITEM NUMBER	SECTION I & II DESCRIPTION	SECTION I & II PAGE 1	SECTION I & II CONT PAGE
1-3	JOB CONTROL NUMBER	M	M
4	ALTERATION IDENTIFICATION	IP	IP
5	EQUIPMENT IDENTIFICATION CODE	M	NR
6	ACTION TAKEN	M	NR
7	EQUIPMENT NOUN NAME	M	NR
8	SHIP'S FORCE MANHOURS EXPENDED	M	NR
9	ACTIVE MAINTENANCE TIME	M	NR
10	COMPLETION DATE	M	NR
11	METER READING	IP	NR
12	JOB DESCRIPTION (REMARKS)	O	NR

ITEM NUMBER	SECTION III DESCRIPTION	REMOVE (R/D)	INSTALL (I/A)	MODIFY (M/C)
13	COMPONENT NOUN NAME	M	M	M
14	QUANTITY	M	M	M
15	COMPONENT ACTION	M	M	M
16	COMPONENT IDENTIFICATION	IP	IP	IP
17	COMPONENT SERIAL NUMBER	IA	IA	IA
18	COMPONENT APL/AEL	M	IA	IA
19	LOCATION	M	M	M
20	EQUIPMENT IDENTIFICATION CODE	NR	IA	NR
21	NEXT HIGHER ASSEMBLY	IP	IP	IP
22	SERVICE APPLICATION CODE	IA	IA	IA
23	WORK CENTER	NR	M	NR
24	NAMEPLATE DATA	NR	M	NR
25	MAINTENANCE INDEX PAGE	IA	IA	IA
26	EOSS	IP	IP	IP
27	TECH MANUAL NUMBER	IA	IA	IA

LEGEND

IA IF AVAILABLE
IP IF APPLICABLE
M MANDATORY
O OPTIONAL
NR NOT REQUIRED

SECTION I BLOCK 6 ACTION TAKEN

5A — PARTIALLY COMPLETED ALTERATION
5B — FULLY COMPLETED ALTERATION
5C — FULLY COMPLETED EQUIVALENT TO ALTERATION
5D — ALTERATION DIRECTIVE NOT APPLICABLE
1 — MAINTENANCE ACTION COMPLETED PARTS DRAWN FROM SUPPLY
2 — MAINTENANCE ACTION COMPLETED REQUIRED PARTS NOT DRAWN FROM SUPPLY (LOCAL MANUFACTURE PRE EXPENDED BINS)
3 — MAINTENANCE ACTION COMPLETED NO PARTS REQUIRED

SECTION III BLOCK 15 COMPONENT ACTION

MAINTENANCE ACTIONS

R — REMOVED EQUIPMENT
I — INSTALLED EQUIPMENT
M — MODIFIED EQUIPMENT

CONFIG FILE CORR NO MAINTENANCE ACTION

A — ADDITION OF RECORD
D — DELETION OF RECORD
C — CORRECT/CHANGE EXISTING RECORD

WORK CENTER SUPERVISOR
DIVISION OFF
SUPPLY DEPT
3 M COORDINATOR
SHIP SEQUENCE NUMBER
PAGE ________ OF ________

63.82

Figure 4-13.—OPNAV 4790/CK, Ship's Configuration Change Form.

The procedures for completing MDS forms can be found in OPNAVINST 4790.4, chapter 9.

INSURV DOCUMENTATION.—Approximately 6 weeks prior to an INSURV inspection, the INSURV board forwards copies of INSURVINST 4739.11 to the ship to be inspected. This instruction contains guidelines for preparation of deficiency forms.

The INSURV deficiencies presented to the INSURV upon their arrival consists of the automated OPNAV 4790/2Q or 4790/2R forms and the handwritten OPNAV Form 4790/2Ks for those instances when it is necessary to document maintenance deficiencies not included in the CSMP. These automated forms are sent to the ship for screening 30 days prior to the scheduled INSURV. The command should review all outstanding INSURV items since the last inspection. Deficiencies that are not required to be reported on are:

1. individual ship alterations (SHIPALTS), ordnance alterations (ORDALTS), and field changes
2. minor facilities maintenance deficiencies, such as dirty bulkheads, burned out light bulbs, and so forth
3. individual documentations of defective deck fittings and closures, gauges, and other small equipment or components

For deficiencies identified during the inspection, the INSURV team will assign a number to the applicable OPNAV Form 4790/2K. This number is entered in block 20 of OPNAV Form 4790/2K.

Upon completion of the INSURV inspection, all INSURV reported deficiencies should be documented immediately upon completion of the action required. All deficiencies requiring outside assistance, or those that are not corrected by the ship's force within 30 days, are documented as deferrals. Deficiencies previously identified and processed by ADP should be modified to include the assigned INSURV number. In the case where multiple discrepancies were identified on a single OPNAV Form 4790/2K, appropriate maintenance personnel will complete a 4790/2K form for each discrepancy using the same INSURV number on each form. A post INSURV report will be produced displaying all deficiencies on a one-time basis by the ADP facility maintaining the ship's CSMP file. Those deficiencies that are screened as Code 9 will then be placed into historical records that are maintained by the NAMSO to be recalled at the type commander's discretion (these are items judged inappropriate for retention in the CSMP).

CURRENT SHIP'S MAINTENANCE PROJECT (CSMP).—The purpose of CSMP (fig. 4-14) is to provide shipboard maintenance managers with a consolidated listing of deferred corrective maintenance in which to manage and control its accomplishment. The requirement is to record in the CSMP all such ship's deferred maintenance. The CSMP is the basic management tool used aboard ship. The work center supervisor is responsible for ensuring that the CSMP accurately describes the material condition of the work center.

The CSMP is a valuable management tool for you, as a weapons officer. It enables you to plan actions to accomplish deferred maintenance. It also enables you to evaluate the performance of your work center supervisors in the management of their work centers.

The CSMP reports are divided into three areas, as follows:

- CSMP Report 1—This report is produced in six options. These options present single line summaries of each incompleted deferred maintenance action.

1. Option A—Summary by type availability. This option (together with CSMP Report 2) will be provided in three copies to the ship on a routine basis 45 days before and after a maintenance availability. It provides a single line description of each deferred maintenance action in the following sequence: ship, work center, type availability, and job sequence number (JSN). It also furnishes a breakdown of the total man-hours required in order to perform the maintenance. This, too, is broken down by work center, department, and the ship's total man-hours.
2. Option B—Summary by work centers. This option is available upon request and contains the same information as option A.
3. Option C—Summary by INSURV number. This report is provided to the ship 30 days after an INSURV inspection is conducted. Only items assigned INSURV numbers will appear. It also contains the same information as option A except for the listing by INSURV number.
4. Option D—Summary by safety related deficiencies. This report is provided on a request basis. It is restricted to only those items that are

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                    CURRENT SHIPS MAINTENANCE PROJECT REPORT 1—OPTION A                 PRODUCED 06 JUN 83
                           SUMMARY BY TYPE AVAILABILITY GROUP                           DATA AS OF 06 JUN 83

                                                                                        PAGE    29
NEW JERSEY             BB -62          UIC-03062                 IUC-NA

WORK CENTER EM02                                     IMA/TYCOM SUPPORT UNIT
                                                                 DEFR       DEFR        T  SCREEN——DEF. MAN-HOURS——
JSN  NOUN NAME         IDENT           CSMP SUMMARY / ALT ID     DATE       REAS  PRI   A  IUV/TY     S/F    IMA    DEP

0003 DECK PLATES       VARIOUS         REPLACE DECK GRATING      29 NOV 82   6     3    2   6 / 2             80

0007 LP TURBINE        NO 4            AFTER WASTE DRAIN MISSING 23 NOV 82   6     2    2     / 2      1       1

0024 MAIN CIRC PUMP    NO 2            STEAM LEAKOFF TUBING BROKEN 23 NOV 82 6     2    2   6 / 2      1       8

0028 SSTG              NO 3            VACUUM GAGE LINE RELOCATE 23 NOV 82   6     2    2     / 2    AUTO   COMP

0056 PLAST ENGRAVING   NOT LISTED      LABEL PLATES MISSING      04 DEC 82   6     2    2     / 2      3    COMP

0094 EXHAUST VENT      VARIOUS         EXHAUST VENT SCREENS WRONG SIZ 14 JAN 83 2  1    2   6 / 2    AUTO   COMP

0139 CUT OUT VALVE     AUX EXHAUST     LEAKS BY                  16 MAR 83   6     2    2   6 / 2      2    COMP

0140 PLASTIC ENGRAV    VARIOUS         GAGES HAVE NO IDENTIFICATION 15 JAN 83 2    2    2     / 2      3    COMP

0142 REACH ROD         HP TURB CAGE    CUT OUT VLV NEEDS REACH ROD 15 JAN 83 2     2    2     / 2      2    COMP

0143 COVERS PROJECT    VARIOUS         NOT INSTALLED ON WIRE WAYS 16 MAR 83  6     2    2   6 / 2      4    COMP

0144 REACH ROD         ND 3            ROOT VLV IS INACCESSIBLE  16 MAR 83   2     2    2     / 2      2    COMP

                                                         TOTALS                                18      89

                                             WORK CENTER TOTALS                                18      89
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63.83

Figure 4-14.—OPTION A, Summary by Type Availability.

listed on the CSMP which have been assigned an X in block 15 (SAFETY HAZARD) of OPNAV Form 4790/2K. It also contains the same information as option A.

5. Option E—Summary by equipment identification code (EIC). This report is also issued upon request and contains the same information as option A.

6. Option F—Summary by INSURV number and type availability. It is provided as requested. The information contained in option F is identical to option C.

- CSMP Report 2—This report is a detailed record of the ship's deferred maintenance by JSN within work centers. If a deferred action has been documented as a safety hazard or has been assigned an INSURV number, the words *SAF HAZ* or the INSURV number will appear in the comment column.

- CSMP Report 3—This report contains the same type of information as CSMP Report 2, but it is listed by JSN within each work center within an EIC.

We have only briefly touched upon the 3-M Systems. For a more detailed explanation, refer to OPNAVINST 4790.4. As a management tool, the CSMP is invaluable to department heads. You should make use of this management aid—it will make your job both easier and more productive.

BATTERY ALIGNMENT

The intention here is not to give you a step-by-step description of the procedures used in a dry-dock alignment or an afloat alignment, but to point out that this seemingly simple topic is extremely complex and is perhaps the area to which you, as weapons officer, should devote a major portion of your attention, not just in fits and starts, but constantly! This will ensure that proper procedures are being used within your systems, and coordinating interalignment with the other ship search and ordnance delivery systems. The basic reference is *Theory of Combat System Alignment*, SW225-AO-MMA-010/OP762. This publication covers the basic principles of alignment in dry dock, alignment afloat, and internal alignment. The basic principle governing the interconnection of installations, such as torpedo tubes, missile launchers, rocket launchers, projectors, different caliber guns and different marks, and fire control systems, is that the installations involved must be aligned to common references, and these references must be selected to provide for an efficient alignment procedure. The importance of this last statement becomes apparent when you consider that modern ordnance installations are operated almost exclusively in automatic control; errors which result from bad basic alignment have a tendency to show up when a missile system target is designated to a gun system; and the gun system fails to acquire the target even though both systems are perfectly internally aligned, but have been improperly aligned to a common reference.

Gun Alignment

Alignment procedures for gun batteries will vary from ship type to ship type, but in principal, you should follow the procedures laid out in SW225-AO-MMA-010/OP762. Battery alignment for DD-type ships is given in detail in SW225-XX-CSA-010/OP 2456 (*Combat System Alignment*). There are 35 volumes of this manual, with some supplements. The supplements usually are generally limited to ASW system alignment.

ASW Battery Alignment

As mentioned before, some of the supplements to the OP 2456 series of volumes address themselves to this topic. Alignment procedures for the Mk 114 system generally will be found in NAVORD OP 2983 and specifically in OD 10729, OP 2456, and the installation and maintenance data OD for each ship class. The basic reference plane for this system is the first foundation machined on the fire control plans. All elements within the system, sonar, launcher, and so forth are aligned to the reference, as are the gun and missile batteries.

Search radars and other assorted sensors are all aligned to some bench mark, which has been, in turn, aligned to some basic reference that has been established on the ship during the basic installation and dry dock alignment. Although this equipment is not under your cognizance, you should ensure that it is aligned properly because its inputs to your systems will affect fire control acquisition times and system performance directly through errors in alignment.

Surface Missile System (SMS) Battery Alignment

Alignment procedures for missile batteries are detailed in one of the volumes of the weapons system OPs and related ODs. For most guided missile launching systems (GMLSs), alignment is contained in volume 7 of the weapons system OP for each class of ship. Once again, SW225-AO-MMA-010/OP762 is the basic for all of these OPs.

QUALIFICATION TRIALS

The ship qualification trials (SQT) program dates back to 1960 with the introduction of the guided missile systems into the fleet. As originally conceived, CNO approved the SQT program to provide the necessary technical assistance to ensure that the ship's company became qualified to create and maintain the missile systems. As our weapon systems have become more complex and sophisticated, the program has expanded its coverage to include more elements of the ship's systems. Recent dialogues with the fleet have shown the desire to consolidate the various new construction and post-overhaul tests. The following subjects deal with this new program; combat system ship qualification trials (CSSQT) and the weapons systems accuracy trials (WSAT).

Combat System Ship Qualification Trials (CSSQT)

The systems to be evaluated in the CSSQT program will vary depending upon the configuration of the ship, but they normally consist of the following:

1. Surface missile systems
2. Antisubmarine warfare systems
3. Search radars
4. Gun weapons systems
5. Command and control systems

The procedures, policies, and objectives for conducting the CSSQT are in NAVSEAINST 9093.1. Currently, ships that are completing new construction, modernization, or overhaul are subjected to the CSSQT. These tests will include the gun/missile SQT, antisubmarine warfare (ASW) Weapons Systems Accuracy Trials (WSAT), and the Fleet Operational Readiness Accuracy Check Sites (FORACS). The CSSQT provides the ship with a single test package coordinated by one officer-in-charge. It eliminates the confusion of having separate programs competing simultaneously for the same equipment. The CSSQT minimizes the time required to brief and debrief each ship, reduces redundant testing, and provides a single report on all systems.

The NAVSEASYSCOM is responsible for the CSSQT program; however, assistance and support is required from other commands. Specific responsibilities are outlined in NAVSEAINST 9093.1, Combat System Ship Qualification Trials (CSSQT) for Surface Ships, Policies, Objectives, and Procedures for.

Weapons System Accuracy Trials (WSAT)

The WSAT program was established in the fleet in 1965 aboard submarines; it was subsequently expanded to include surface ships. Today, WSAT is one of the foremost ASW test programs available, constantly striving to ensure the highest degree of fleet readiness.

A typical WSAT systematically progresses through four distinct phases. It begins with static dockside grooming of equipments, to the firing of dummy or preset weapons, through on-range dynamic testing of the sensor/weapon system interface, and culminates with weapon firing exercises on an instrumented tracking range.

Technical manuals, OD 43690 for submarines and OD 40087 (first revision) for surface ships, define the underwater systems and ancillary equipments test programs, the parameters to be measured, the conditions, the measurements, and the tolerable allowances.

WSAT demonstrates the ability of an ASW weapon system to meet prescribed system and subsystem standards of performance from target detection to weapon launch and its attack on a target. The results obtained from the trials are used by the Manager, ASW Systems Project Office, as one basis for ASW weapon systems certification.

Usually ships are scheduled for WSAT by the type commander following construction, shipyard overhaul, or extended restricted availability in which extensive modification and work is performed on the weapon system. This method of scheduling can detect errors in the weapon systems before the ships report for fleet duty; and in addition, it has the added advantage of effecting considerable cost savings to the government by detecting deficiencies within the warranty period of ships of new construction.

Approximately 1 month before the scheduled trials, the WSAT activity conducts an onboard briefing for ship personnel and delivers copies of the appropriate NAVSEA OD and operation/test plan tailored to the ship. This plan includes schedules, plans, instrumentation required, and all-inclusive information related to the trials program.

MAINTENANCE OF ORDNANCE EQUIPMENT

Earlier in this chapter, we discussed maintenance to a certain extent. We are now going to touch briefly on equipment preservation, maintenance records and publications, and the technical assistance that is available.

Painting

Although painting, as a preservative, is important, it is considered secondary to equipment functioning. Painting should be discussed, however, because too often personnel spend valuable time painting to make their spaces look good and neglect the most important aspect of their work, operational readiness of their equipment.

There are important considerations to be kept in mind in ordnance painting. One is that all personnel in the department should be familiar with the type commander's painting instructions, as well as *Naval Ships' Technical Manual* requirements.

Lubrication fittings and operating linkage are particularly vulnerable items to loose painting habits. These items should never be painted. If these items should be inadvertently painted, the paint should be wiped off while it is still wet before proceeding with the paint job. Nameplates of all types, particularly ordnance nameplates, always seem to pose a problem to painters. They must never be painted over. The information stamped or stenciled on the nameplates should always remain readily obtainable without first having to scrape off paint.

Sloppy paint jobs are unacceptable and must be discouraged. Neatness in painting can add much to the stature of the department and save time in cleanup after painting.

Lubrication

The proper lubrication of ordnance equipment is perhaps one of the most important maintenance operations in the weapons department. To ensure proper operation of equipment, lubrication must be consistently performed as scheduled.

Lubrication charts normally are contained in the OPs for the equipment and/or on the 3-M Systems MRCs. The charts show the points of application, the frequency with which points are to be lubricated, and the type of lubricant to be used. Frequent referral to the lubrication charts will assure use of the proper lubricant.

Listed in OD 3000 are the prescribed lubricants to be used on ordnance equipment. Lubrication charts are subject to revision from time to time, so it is important to have the latest revision to use as a guide.

Sometimes the question will arise as to the advisability of using substitutes for the designated lubricants. NAVSEASYSCOM has issued positive instructions that substitutes may be used only in situations of extreme emergency. The reason for this is the differing chemical properties of greases and oils. Substitutes, when used, must be replaced by the authorized materials at the first opportunity.

Maintenance Publications

In addition to 3-M material, many valuable sources of maintenance information exist for fleet use and are often unused because of lack of awareness of their existence. Examples include the deficiency corrective action program (DECAP) for gun mounts and GMLSs and the torpedo management information system (TMIS) for torpedoes. Other examples include the *NAVSEA Journal* and *Deckplate* that are issued by NAVSEA, and *Surface Warfare*, issued by OPNAV.

When permitted by security requirements, technical information should be made readily available to operating maintenance personnel. Working copies of the various sources of technical information should be stowed in weapons workshops and spaces. Bookshelves or lockers should be provided to keep this material near at hand so that personnel who need to know will have the opportunity to acquire the information. Intimate knowledge of equipment from OPs, drawings, and other sources is vital to the planning of routine upkeep and tests, adjustments, and periodic maintenance and repairs.

Maintenance Records

The retained copies of the 3-M schedules are now the principal sources of maintenance history information on new construction. On older ships, material history cards, in addition to the retained copies of the 3-M Systems' CSMP, provide the maintenance history. Many of the former sources of this information were replaced by the 3-M Systems. The machine printout of data from the 3-M Systems report forms provide a valuable record.

Mobile Technical Units (MOTUs) and Other Technical Assistance

One of the objectives of NAVSEASYSCOM is to ensure that all naval units attain the maximum degree of self-reliance in operation, use, and maintenance of ordnance equipment. To serve this objective, special assistance is provided as follows:

- Contract service engineers are engineers and technicians specially trained by a contractor to handle specific equipments. These personnel are available on an "as required" basis either by specific assignment to activities or service commands or by a specific request to NAVSEASYSCOM. Special ordnance command instructions are issued periodically to cover these services.

- MOTUs are specifically selected and trained groups of military personnel assigned to and made available by Commander Service Force Pacific and Commander Service Force Atlantic. These groups normally are made available for assistance in the maintenance of newly installed equipment, but may be called upon in an emergency.

- Civilian engineers and technicians assigned to Naval Sea Support Centers (NAVSEACENS), Atlantic and Pacific, are also available for assistance on request.

All of the above groups, once the assistance has been rendered, or it has been found that the equipment cannot be repaired or that deficiencies in its operation are corrected without extensive work, prepare reports to their respective superiors. The ship's copy of these reports is an invaluable record that will provide exact information for future job requests when the ship is assigned to an upkeep or yard availability period.

OVERHAULS AND AVAILABILITIES

Constant attention must be given to material upkeep, and definite time intervals must be allotted for general overhaul and repair. Many equipment defects are within the repair capacity of the ship's force, but some require the attention of a major repair activity.

A ship may not informally and on its own initiative go alongside a repair ship or enter a shipyard for repairs. The type commander must first assign a ship an "availability" at the repair activity. U.S. Navy Regulations defines an availability as "The period of time assigned a ship by competent authority for the uninterrupted accomplishment of work at a repair activity."

Types of Availabilities

The different conditions and purposes of availabilities are as follows:

- An *upkeep period* is a period assigned to a ship while moored or anchored for the uninterrupted accomplishment of work by the ship's force or other forces afloat. Ships are assigned upkeep periods at more or less regular intervals between operating periods.

- *Voyage repairs* are availabilities for emergency repair work that is necessary to enable a ship to continue its mission. The work must be accomplished without change to the ship's operating schedule or its general steaming notice.

- A *technical availability* is an availability for the accomplishment of specific items of work by a repair activity, with the ship NOT present. This type of availability is usually granted when a removable unit needs repairs and can be left at the repair activity while the ship continues on its mission. Arrangements must be made for delivering the defective unit to the repair activity and for shipping or delivering the unit on completion of repairs.

- A *restricted availability* is an availability for the accomplishment of specific work items by a repair activity. The time required for this availability must be taken from the ship's operating time, and therefore the repairs are less extensive.

- A *regular overhaul* is an availability for the accomplishment of general repairs and alterations at a naval shipyard or other shore-based repair activity. Regular overhauls are cyclic, and the period between overhauls is recommended for each ship type by NAVSHIPS and the type commander. The type commander then prepares a regular overhaul schedule for each ship in the command. As the assigned overhaul date for a particular ship approaches, the type commander requires the ship to submit its work requests, then transfers overhaul funds to the appropriate shipyard, and directs the ship to report on the assigned date to the shipyard. For a better understanding of availability, refer to NAVEDTRA 10858-F (*Engineering Administration*).

Board of Inspection and Survey

The Board of Inspection and Survey consists of a flag officer as president and such other officers as may be necessary for assistance in carrying out the duties of the board as prescribed by law and U.S. Navy Regulations. The parent board under the direction of the president and the East Coast deputy has its headquarters in Washington, D.C. Permanent boards, in addition to the parent board, are located at key points on the East and West Coasts, and at Pearl Harbor. There are semipermanent boards situated in each naval fleet and reserve fleet group and at a few overseas locations.

Prior to inspection, the ship's commanding officer must submit to the board a list of all repairs and alterations deemed necessary. Virtually everything on board must be opened up prior to the arrival on board of the inspecting party—3-M records as well as all logs and other records. (The CSMP must be made available for the inspecting party's examination.) The material records will be given a very careful analysis; they must be accurate and up to date.

Upon completion of the inspection, the board will report the general condition of the ship and its suitability for further naval service, together with a list of the repairs, alterations, and design changes that, in its opinion, should be made. These reports are made to CNO with copies going to the fleet and type commanders. The board's recommendations ordinarily become the basis for work to be done by the shipyard, tender, or the ship's force.

INSURV materiel inspections are conducted following statutory requirements of Congress that specify the materiel inspection of a U.S. Navy ship (1) upon the ship's return from a foreign station, (2) at least once every 3 years (if practicable), (3) when fitness of the ship for further service is in doubt, and (4) when the ship has been declared unfit and stricken from the *Naval Vessel Register*.

INSURV materiel inspections are conducted at such time and place as may be mutually agreeable to the board and the type commander. The inspection starts promptly upon arrival of the board, and the ship must be moored to a pier or dock during the inspection to permit disabling of machinery. INSURV materiel inspections normally are not scheduled during regular overhaul or tender availability, and repair work during an inspection should be kept to a minimum.

Approximately 6 weeks prior to the INSURV inspection, the board will send to the ship a copy of INSURVINST 4730.11 (Preparation of Deficiency Forms). The activity responsible for presenting a ship to the Board of Inspection and Survey for inspection prepares the deficiency forms. The preparation of proposed deficiency items is explained in detail in INSURVINST 4730.11. Deficiency forms consist of either 5 × 8 inch NCR (no carbon required) cards or OPNAV Form 4790/2K. The 5 × 8 inch NCR cards are used for all acceptance trials, combined trials, underway trials, surveys, and materiel inspections of other than active fleet ships. OPNAV Form 4790/2K is used for all final contract trials, guarantee materiel inspections, and materiel inspections of active fleet ships. Deficiency forms must be prepared (in triplicate) for all known deficiencies existing in the department and presented to the weapons inspector on arrival aboard ship. In addition to repair deficiencies, they should cover deficiencies in design, recommended alterations, equipment requiring excessive maintenance, safety hazards, and so forth. Write each item as a deficiency, not in the form of a work request. Put group deficiencies that apply to a single space on one form where practicable to reduce the total number of forms. Accept no deficiency items for inclusion on the INSURV list until it has been viewed and validated by an INSURV member. INSURV members will also generate new items during the course of their inspections. For all deficiencies, ensure that blocks 44 through 47 of OPNAV Form 4790/2K are completed with the assigned INSURV number and that the inspectors' remarks/descriptions are included.

All weapons spaces except living spaces will be inspected by the weapons inspector. Emphasis should be placed on proper demonstration of equipments and systems. The test program outlined in the applicable NAVSEA OD should be used as a guide in the conduct of the inspection. Those ships for which a test program has not been issued will be required to demonstrate all weapons systems. This requirement includes inspection/demonstration of all of the following:

1. Target designation system
2. Mount/launcher operation in all modes
3. Fire control systems including fire control radars
4. Ammunition stowage spaces
5. Weapons handling systems including both strike up and strike down facilities
6. Magazine sprinkling systems
7. Flooding and high temperature alarm systems

The spaces will be opened for inspection following INSURVINST 9080.2. Personnel must be available to open locked spaces. Immediately upon arrival of the inspection parties, the personnel responsible for a space and the operation of the equipment there must be present in the space to assist the inspection party by answering questions and operating equipment.

The operational aspects of all equipment and material will be examined during the conduct of the INSURV materiel inspection with the exception of equipment opened or disassembled for a more detailed inspection.

A critique is held upon completion of the INSURV materiel inspection. At the critique, each member of the board reviews the results of the inspection, and the ship's officers are afforded the opportunity to comment on each board member's remarks. For small ships with relatively inexperienced heads of departments, each board member states the results of the inspection in sufficient detail to fully appraise the commanding officer of the conditions found. Work items covering deficiencies corrected prior to the critique are removed from the work list.

The senior member of the INSURV board conducting the materiel inspection submits a complete report of the results of the inspection (including the departmental evaluations, the inspector's remarks, and the list of work items) to the President of the Board of Inspection and Survey, with copies to the appropriate type commander and other interested commands, bureaus, and offices of the Department of the Navy. The INSURV board, conducting a material inspection, assigns no numerical grade or particular award of merit but simply finds that the ship is in a satisfactory or unsatisfactory materiel condition of readiness for war or for further naval service.

Whenever any significant unsatisfactory condition is disclosed during an INSURV materiel inspection, the senior member of the inspection board makes an advance report to the President of the Board of Inspection and Survey (copies to the appropriate fleet and type commanders and other interested commands, bureaus, and offices of the Department of the Navy) to ensure that corrective action is initiated promptly. The speedletter report is forwarded no later than the next working day after completion of the inspection. Only those deficiencies considered to be of significance to the top levels of OPNAV and the fleet and type commanders are included in the advance report.

Whenever, as a result of an INSURV materiel inspection or trial, the inspection board believes that the condition of the ship under inspection or trial is such as to reflect credit or discredit upon any officer attached to the ship, such opinion is made the subject of a separate letter addressed only to the officer's reporting senior with a copy to the officer concerned.

REPAIR ACTIVITIES

Ships can operate only a certain length of time without repairs. To maintain a ship in prime condition, constant attention should be given to material upkeep; and definite intervals of time must be allotted for general overhaul and repairs. Even when regular maintenance procedures are carefully observed, accidents and derangements may necessitate emergency repair work. Repairs and alterations may be accomplished by the repair force afloat or repair activities ashore. Repair activities afloat include both repair ships and tenders. Repair activities ashore include shore IMAs, naval shipyards, private shipyards, and ship repair facilities (SRF) that are usually located outside the continental United States.

Afloat Repair Activities

While shore-based repair facilities perform a great service, they have one severe limitation: they are immobile. To overcome this limitation, the Navy has gone to great lengths to develop mobile repair capabilities. During World War II, advanced base repair facilities, consisting of floating dry docks and repair shops, were able to repair all but the most extensive battle damage. This greatly reduced the time required to return individual ships to combat, and thus contributed to the overall success of our naval forces. Today, most of our mobile repair facilities have been mothballed; however, repair ships and tenders continue to serve the fleet in even the most remote locations.

Repair ships are primarily concerned with general fleet maintenance, while tenders support in all respects the specific type of ship to which they are assigned. On a repair ship, we find general maintenance facilities for a number of ship types, and large stocks of commonly used repair parts. On a tender, the facilities are specifically designed for the type of ship tended, and the material items are peculiar to that type.

Ships are periodically scheduled for routine overhaul periods alongside repair ships or tenders.

The frequency of these periods vary according to the different ship types. Most ships have a tender overhaul period every 6 months, and that period of time is normally about 2 weeks. These tender overhaul periods are planned far in advance and depend upon the quarterly employment schedule of the ship concerned.

Shore-Based Repair Activities

Shore-based repair activities include naval repair facilities under the management control of the NAVSEASYSCOM or the CNO and commercial ship repair yards under contract to the Navy.

A *naval shipyard* is a component activity of a naval base. Its primary mission is to render service to the fleet in an efficient and economical manner, by building, repairing, altering, overhauling, docking, converting, and outfitting ships. Naval shipyards may be designated as a home yard and/or a planning yard. A home yard is the shipyard to which a particular ship usually is assigned for accomplishment of repairs and alterations. A planning yard is a shipyard designated by NAVSEASYSCOM to perform design work for specific types of ships.

Commercial shipyards have approximately the same capabilities as naval shipyards for repair and alteration, and usually have greater shipbuilding facilities. During World War II, many naval ships were constructed at private building yards. Naval shipyards were then free to perform repairs on war-damaged ships. If these private shipyards are to maintain their flexibility, they must be awarded peacetime contracts for both shipbuilding and overhauling of ships.

In addition to shipyards, the Navy also operates several *ship repair facilities*, and some naval bases include a *ship repair department* in their organization. Ship repair facilities have a limited capacity in performing the same repairs as naval shipyards. They normally are used for emergency ship repairs; although in some forward areas, they may be assigned as the regular overhaul activity for ships permanently stationed in the area. All naval base ship repair departments are definitely limited in their ship repair capability and may consist solely of a small boat repair facility.

PREPARATION OF WORK REQUESTS

An overhaul is an undertaking which may vary from a few man-hours, to many thousands of man-days. Despite this spread, each overhaul is a major enterprise that requires all concerned to make the proper preparations.

The first and most important step in these preparations—preparation of work requests and the associated deferred actions—must be made by the ship's company. If this is not done well, there is little chance for a successful overhaul. It has been said that a well-run ship is ready to go into overhaul on a moment's notice.

The use of OPNAV Form 4790/2K will reflect what jobs must be accomplished during a yard period or tender availability. The current type commander's instructions must be consulted prior to preparing work requests for submission.

Aside from the data to be filled in on the upper part of OPNAV Form 4790/2K, the most important section of the form is the information that describes the type of work requested. This description should be clear and concise and should explain just what work is to be done or what repairs are to be made. Generalities or hazy information should be avoided. All available pertinent data should be provided when the work or corrective action cannot be specifically described. Expressions such as *repair as necessary* are not explicit and should be avoided. In cases of routine tests, inspections, or periodic overhauls, specific references or authorities should be cited. Some degree of precedence should be established by the ship in this routine work. Avoid wholesale requests for overhaul of pumps, motors, generators, and so forth unless they are accompanied by adequate supporting data. Include all operating history and data that will help clarify what repairs are to be done and why they are needed.

Information provided by a work request is vital to efficient advance planning by the repair activity and cannot be overstressed. If this information is complete and accurate, the repair activity can make a good diagnosis. But if necessary information has been omitted, considerable time and money may be wasted in an attempt to find the difficulty. Remember, the engineers and technicians who must do the job have not been living with the equipment for months, and they cannot be expected to know how and when the trouble was first noted. Often, they will have no opportunity to witness the operation of the unit, and must make their diagnosis entirely on the basis of the information on the work request.

Alterations

An alteration is any change in the hull, machinery, equipment, or fittings that involves a change in design, materials, number, location, or the relationship of the component parts of an assembly regardless of whether it is undertaken separately from, incidental to, or in conjunction with other repairs.

Alterations that affect the military characteristics of a ship may be approved only by CNO, who also establishes their relative priority. All such alterations are classed as SHIPALTs.

Alterations other than those affecting military characteristics may be approved by the cognizant systems command without reference to CNO. In general, alterations of this type concern matters of safety, efficiency, and economy of operation or upkeep. The systems command is responsible for determining whether military characteristics are involved.

Alteration Requests

Whenever the commanding officer determines that an alteration is advisable or necessary, a request is initiated outlining the changes required. The request is submitted to the head of the cognizant systems command or office in standard letter form. In addition to discussing the proposed change, the request must cover the following points:

1. The estimated change in weight or moment about the center of gravity and the recommended action where compensation is required.
2. In cases where a reduction in the crew's living spaces is indicated, a statement of the amount of space affected along with amplifying reasons.

Alteration requests are forwarded via the type and/or administrative commander for their endorsement and recommendations. Copies of the request may also be sent to the commanding officers of other ships of the same type for information.

Although suggested alterations may be recommended by the Board of Inspection and Survey, they normally will not be acted upon by the systems command until receipt of appropriate requests from the commanding officer, and recommendations thereon by the type commander. Upon receipt by the systems command, the requests for alterations which affect military characteristics (SHIPALTs) are forwarded with a recommendation to CNO for action. Other requests are acted upon by the systems command after consideration of all the factors involved.

The word *approve* in connection with an alteration indicates the systems command action on the proposed change. Approval alone, however, does not constitute authority to proceed with the work. The word *authorize* is used to signify the systems command's permission to proceed, and its granting of funds for a particular ship during an availability.

Ship Alterations (SHIPALTs)

Approved alterations under the cognizance of NAVSEASYSCOM are known as SHIPALTs. SHIPALTs are issued on NAVSEA Form 99. Each SHIPALT is identified by a composite number consisting of two number groups joined by "A," "K," or "D." "A" and "K" SHIPALTs are funded by NAVSEASYSCOM, while "D" SHIPALTs are funded by the type commander. The first number is the type serial number—that is, the consecutive number assigned for a ship type (DD, DDG, CG, and so forth). The second number is the serial number of the ship—that is, the consecutive number assigned for a specific ship within the type.

SHIPALTs apply to shipboard machinery and equipment under the cognizance of NAVSEASYSCOM. This includes items that are often thought of as ordnance equipment, such as ASROC launchers, ammunition dredger hoists, and director or mount foundations. A general rule for determining cognizant responsibility is that NAVSEASYSCOM's responsibility normally ends with assemblies that are bolted to the hull structure.

In the capacity as repair officer, the engineer officer maintains the ship's master SHIPALT file. All new SHIPALT instructions are received by this officer, as is the responsibility for routing them to other interested department heads. When a SHIPALT instruction is received, deferred action should be prepared for insertion in the CSMP folder.

Receipt of a SHIPALT instruction indicates approval of an alteration. Authorization for accomplishment will be made at a later date by following priority lists. Since "A" and "K" SHIPALTs are funded by NAVSEASYSCOM, they will be accomplished as directed by NAVSEASYSCOM.

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The NAVSEASYSCOM reviews outstanding SHIPALTs for an individual ship in advance of its scheduled shipyard overhaul period, and issues (not later than 4 months before such overhaul) a list of the alterations authorized for accomplishment during the overhaul. This list is based upon the funds available and on the desired order of priority. The type commander, shipyard commander, and the commanding officer of the ship is requested to comment on this list. Upon receipt of their recommendations, the NAVSEASYSCOM may modify the original list of authorized alterations. Work requests need not be submitted for SHIPALTs that are on the list of authorized alterations.

Since class "D" SHIPALTs are funded by the type commander, these are not listed on the NAVSEASYSCOM authorization list, and work requests must be submitted and included in the overhaul work list.

Ordnance Alterations (ORDALTs)

Approved alterations under the cognizance of the NAVSEASYSCOM are known as ORDALTs. An ORDALT instruction is the standard means by which naval activities are furnished necessary plans and instructions for the accomplishment of significant alterations to ordnance equipment. ORDALTs are numbered consecutively without regard to applicability of equipment or vessel.

Unless specifically directed otherwise, the issuance of an ORDALT constitutes authority for its accomplishment. In the case of a shipyard overhaul, NAVSEASYSCOM follows a procedure similar to that in authorizing accomplishment of a SHIPALT.

When an ORDALT is accomplished, it is reported under the ship equipment configuration accounting system (SECAS) to the appropriate Naval Sea Support Center Detachment (NAVSEACENDET) by using a Ship's Configuration Change Form, OPNAV 4790/CK. A feedback report to the ship submitting the configuration change is provided by SECAS. The report for ORDALTs is in the form of a data-processing readout and is designated the Ship Armament Installation List (SAIL), SECAS Report E0010.

ORDALT kits are stored at the Naval Weapons Station (NAVWEPSTA), Crane, Indiana, and the instruction for their completion is provided by the Naval Ordnance Station (NAVORDSTA), Louisville, Kentucky.

The NAVSEACENs, Atlantic and Pacific, are responsible for the completion of all ORDALTs except those assigned to a ship, naval shipyard, or private shipyard.

Actual installation of designated ORDALTs may be accomplished by the ship's force or tender personnel but supervised and verified by NAVSEACEN personnel. ORDALT requiring special team efforts will be accomplished under the direction of NAVSEACEN and supported as required by the in-service engineering agent and/or contractor representatives.

Work Requests

The procedures for submitting shipyard work requests prior to a regular overhaul are found in OPNAV instructions; they are specified in detail in regulations issued by fleet commanders and type commanders.

To permit successful preliminary planning by the shipyard, type commanders require that work requests to be accomplished during a regular overhaul be submitted, for their inspection, screening, and approval, in sufficient time to allow completion of the type commander's action and arrival of the work requests at the shipyard 60 days in advance of the start of the overhaul.

Each work request is submitted on a standard work request form (OPNAV 4790/2K). All work requests are screened and assigned a priority for accomplishment at a conference of the heads of department, the executive officer, and the commanding officer. A work list containing brief statements of the work to be accomplished, arranged in the ship's integrated priority sequence, is prepared and submitted along with the work requests to the type commander for screening action. Following the screening action, the type commander forwards the approved requests to the appropriate naval shipyard or supervisor of shipbuilding (SUPSHIP).

Ship's Force Work

Each ship should, insofar as practicable, be self-sustaining with regard to normal repairs. Each ship should be well supplied with materials, repair parts, and tools and equipment so that much of its own repair work can be accomplished by its own ship's force. Repairs should be undertaken under the supervision of the most competent and experienced personnel. Personnel not familiar with specific repairs and tests should be instructed to take advantage of shipyard or IMA availabilities or IMA assignments to observe how such work is undertaken.

If technical assistance is required to assist the ship's force in effecting repairs, the local type commander maintenance representative should be advised. Numerous sources of technical assistance are available.

The purpose of preventive maintenance is to maintain satisfactory material conditions and to ensure that the equipment or machinery is always ready for service. A regular schedule of cleaning, inspections, operations, and tests is required to ensure trouble-free operation and the detection of incipient faults before they develop sufficiently to be major sources of difficulty.

Most routine inspections and tests are performed by the ship's force. Some of these inspections and tests are quite simple; others require planning so that they can be undertaken during upkeep or overhaul periods. Shipyard and IMA assistance should not be requested unless the test or inspection is actually beyond the capacity of the ship's force.

SHIP EQUIPMENT CONFIGURATION ACCOUNTING SYSTEM (SECAS)

The SECAS has replaced the ordnance logistics information system (ORDLIS) and the ship electronic installation record component index as NAVSEA's equipment accounting system. SECAS is a data collecting program which identifies shipboard equipment/components, locates the identified items, records all associated data, verifies accomplishment of specific engineering changes (ORDALTs, SHIPALTs, and so forth), and provides this information to all concerned engineering activities, supply support activities, and operational managers. In addition, SECAS provides data in support of technical publications, the weapons system file (equipment-to-ship and parts-to-equipment record), PMS, test equipment requirement lists, training course requirements, and Coordinated Shipboard Allowance List (COSAL).

- The Ships Armament Installation List (SAIL), SECAS Report E0010, provides the configuration status of all nonexpendable ordnance systems/equipment on board a ship and includes the applicable ORDALT. A sample SAIL report is shown in figure 4-15. For further information, refer to the *SECAS Program Manual*, Volume 4, NAVSEA TO752-AA-MAN-040/SECAS.

TENDER OR REPAIR SHIP AVAILABILITY

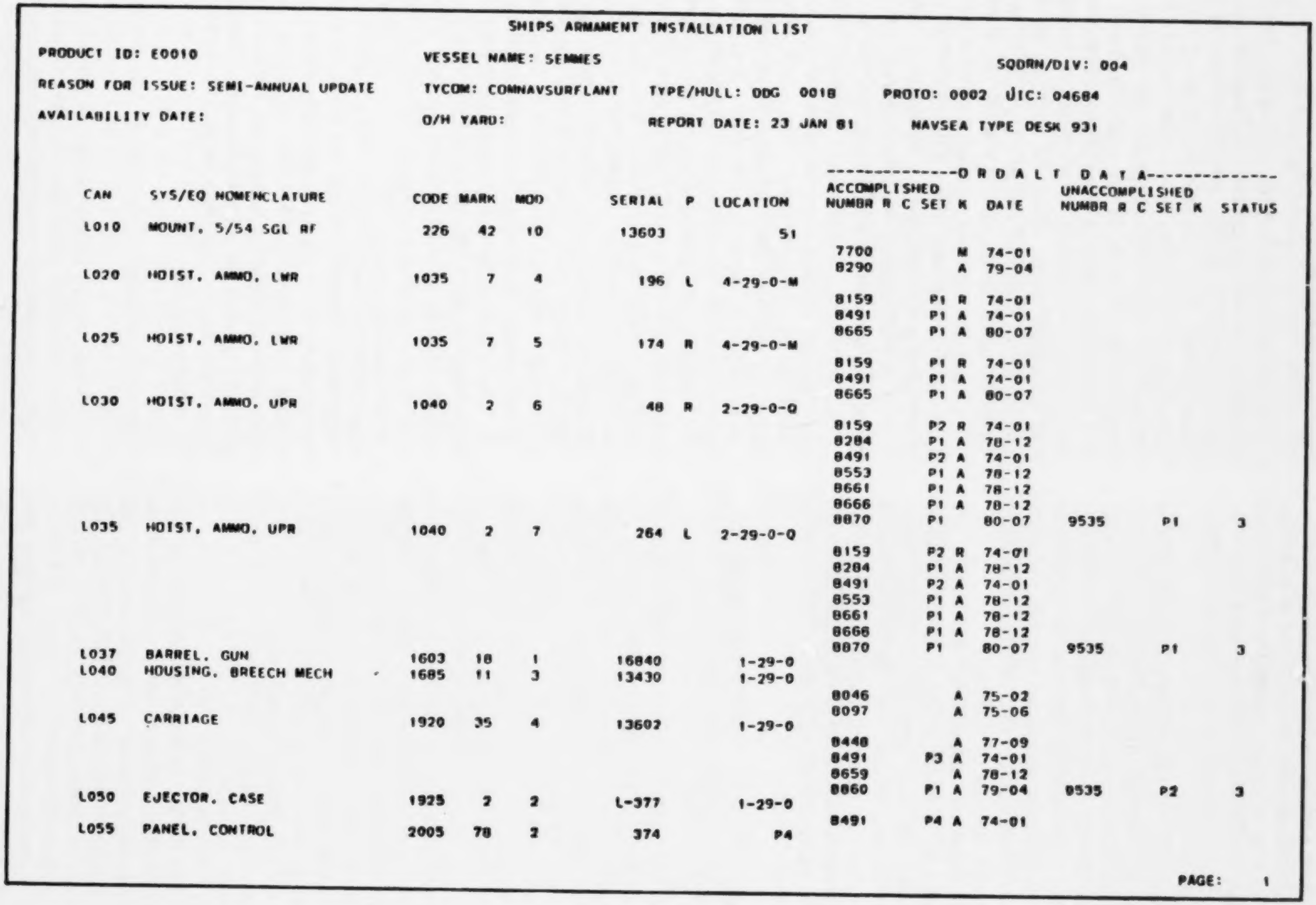
Ships are scheduled for a regular tender availability or an upkeep period alongside repair ships or tenders at certain intervals of time. These time intervals vary with different types of ships. The availability periods are usually planned far in advance and depend upon the quarterly employment schedule of the ship concerned.

When a ship receives its employment schedule or is otherwise notified, it can begin to prepare the necessary paper work in advance of the scheduled availability period. The CSMP and deferred action form, OPNAV 4790/2K, is used as a basis for advance preparation of a work request. Work request sheets (OPNAV 4790/2K, six copies) are completed on outstanding work.

The work requests, with the required number of copies, are sent with a forwarding letter to the type commander. Certain work requests generally are required to have more detailed information included by the command. The staff officer handling material and maintenance screens the work requests. Most of the ship's availability work list items are approved and authorized. The amount of corrective action taken by the reviewing staff officer will depend upon how well the work requests are written and the extent to which they follow established policies and procedures. Upon the completion of this screening, the ship's work requests are forwarded to the repair ship or tender. This is done well in advance of the assigned period of availability so that the repair department personnel can schedule the work and make any necessary preparations. An interdepartment routine request for work requiring assistance by another shipboard department is referred to as an internal (ship's force) work request. The maintenance data form (OPNAV 4790/2K) enforces proper channeling of work requests between departments. This form also permits the setting up of priorities of available manpower, facilities, and routing through the Maintenance Data Collection Center to ensure that complete records of repairs are maintained.

Arrival Conference

When a ship comes alongside for a regular tender availability or an upkeep period, an arrival repair conference is usually held immediately. The conference is attended by representatives of the ship, of the repair department, and (usually) of



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                                      SHIPS ARMAMENT INSTALLATION LIST
PRODUCT ID: E0010                   VESSEL NAME: SEMMES                                               SQDRN/DIV: 004
REASON FOR ISSUE: SEMI-ANNUAL UPDATE  TYCOM: COMNAVSURFLANT   TYPE/HULL: DDG  0018     PROTO: 0002  UIC: 04684
AVAILABILITY DATE:                  O/H YARD:                     REPORT DATE: 23 JAN 81     NAVSEA TYPE DESK 931

                                                                          ---------------O R D A L T  D A T A---------------
                                                                          ACCOMPLISHED                UNACCOMPLISHED
   CAN    SYS/EQ NOMENCLATURE       CODE MARK  MOD     SERIAL  P  LOCATION  NUMBR R C SET K  DATE    NUMBR R C SET K  STATUS
   L010   MOUNT, 5/54 SGL RF         226   42   10     13603            51
                                                                            7700       M  74-01
                                                                            8290       A  79-04
   L020   HOIST, AMMO, LWR          1035    7    4       196  L  4-29-0-M
                                                                            8159    P1 R  74-01
                                                                            8491    P1 A  74-01
                                                                            8665    P1 A  80-07
   L025   HOIST, AMMO, LWR          1035    7    5       174  R  4-29-0-M
                                                                            8159    P1 R  74-01
                                                                            8491    P1 A  74-01
                                                                            8665    P1 A  80-07
   L030   HOIST, AMMO, UPR          1040    2    6        48  R  2-29-0-Q
                                                                            8159    P2 R  74-01
                                                                            8284    P1 A  78-12
                                                                            8491    P2 A  74-01
                                                                            8553    P1 A  78-12
                                                                            8661    P1 A  78-12
                                                                            8666    P1 A  78-12
                                                                            8870    P1    80-07    9535      P1       3
   L035   HOIST, AMMO, UPR          1040    2    7       264  L  2-29-0-Q
                                                                            8159    P2 R  74-01
                                                                            8284    P1 A  78-12
                                                                            8491    P2 A  74-01
                                                                            8553    P1 A  78-12
                                                                            8661    P1 A  78-12
                                                                            8666    P1 A  78-12
   L037   BARREL, GUN               1603   18    1     16840        1-29-0    8870    P1    80-07    9535      P1       3
   L040   HOUSING, BREECH MECH   .  1685   11    3     13430        1-29-0
                                                                            8046       A  75-02
                                                                            8097       A  75-06
   L045   CARRIAGE                  1920   35    4     13602        1-29-0
                                                                            8440       A  77-09
                                                                            8491    P3 A  74-01
                                                                            8659       A  78-12
                                                                            8860    P1 A  79-04    9535      P2       3
   L050   EJECTOR, CASE             1925    2    2     L-377        1-29-0
                                                                            8491    P4 A  74-01
   L055   PANEL, CONTROL            2005   78    2       374            P4

                                                                                                         PAGE:     1
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Figure 4-15.—Ships Armament Installation List (SAIL).

the type commander. The relative needs of the ship and the urgency of each job are discussed. The arrival repair conference serves to clear up uncertainties for repair department personnel who have received and studied the work requests.

Arrangements are also made for the repair ship to provide the primary services of steam and electricity in sufficient quantity to take care of heating and lighting requirements and to provide limited power for ships alongside. In addition to these services, the repair ship may take over the communication watches. Fresh water and fuel requirements are usually supplied from barges.

Work Requests and Job Orders

Although the terms *work request* and *job order* are sometimes used interchangeably, this is not technically correct because the two terms actually have slightly different meanings. Work requests are completed by the ship and are forwarded through proper channels to the repair activity. After a work request has been approved by the repair activity, it is issued as a job order.

As soon as work requests have been approved by the arrival conference, the jobs that require delivery to the tender (ship to shop) should be started. The ship's company is responsible for delivery and pickup of the work requests. Starting these repair jobs early is very important in getting all necessary jobs completed. Equipment that is not needed for the operation of the ship may be disassembled in advance so that the defective parts can be delivered to the tender as soon as the work requests have been approved.

All material delivered to the tender must be properly tagged and identified. The information on each tag should include the number and name of the ship; the department, division, or space; and the job order number. Additional information should be included if necessary. Reference material, such as blueprints and manufacturers' technical manuals, should be identified with the name and number of the ship.

Checking Progress of Repair Jobs

The petty officer in charge (POIC) should know at all times the status of repair work (including the ship's force repair work) being done for the space or equipment. The POIC should keep the division officer apprised of the status of repair work at all times for transmission to the weapons officer.

Tender repairs that are being accomplished on your own ship can be checked by discussing them with the POIC of the repair detail. Checking on the progress of work in the shops on the tender requires planning and coordination between your ship and the tender. Personnel in the tender shops are busy with their repair work, so any method used to check on progress of work must be one that does not interfere with progress.

Some tenders and repair ships have a chief petty officer who acts as the ship's superintendent. If the tender provides a ship's superintendent, it is obviously quite easy for ship's personnel to check on the progress of the work. If the services of a ship's superintendent are not provided, the ship alongside the tender should appoint a petty officer to perform similar duties for the division or department.

A progress chart should be kept for all work that is planned for accomplishment during the repair period. The chart should be kept up to date with respect to the status of each job. Keeping a close watch on the progress of the repair work will ensure that jobs are not unnecessarily delayed, that jobs are not overlooked or forgotten, and that all work undertaken is satisfactorily completed at the end of the repair period.

SHIPYARD OVERHAUL

The primary purpose of a naval shipyard is to render services to the fleet in the form of efficient and economical building, repair, alteration, overhaul, docking, conversion, outfitting, and replenishment, and to perform, when required, related special manufacturing. Naval shipyards perform many other functions, including research and design, which are not discussed here.

Planning

Prior to the scheduled commencement of the overhaul of a ship, the planning department of the naval shipyard generally receives a copy of the ship's work list (with the type commander's action) in the form of a booklet of work requests accompanied by a funds grant for undertaking as many repairs as possible within the funds limitations. Preliminary estimates are developed and sent to the production department, where the production control branch of the repair division uses the estimates for scheduling and workload purposes. Next, the planning department prepares requisitions for material requiring long lead time, and issues a preliminary work booklet for repairs.

Whenever possible, a naval shipyard will send representatives from the planning department, the combat systems office, the nuclear engineering department, and, in some cases, from the production department to inspect the ship prior to its arrival at the shipyard for a regular overhaul. This prearrival inspection affords the shipyard personnel an opportunity to check plans against the ship to determine their applicability; to determine what design services, specifications, or changes are necessary; to determine the special material that will be required; to discover any unusual problems that may be encountered; to check jobs to determine whether preliminary estimates are in consonance with the actual work to be performed; and to conduct a prearrival conference with the ship's officers and the type commander's representative.

After the prearrival inspection or, in the event that it is impossible to conduct such an inspection, as soon as firm information is available, the planning department begins preparation of job orders, based on the ship's work requests. After writing the job order instructions, the department prepares a material list showing, by job order, the quantity, source, stock number, and delivery point of the material required. If shop stores material is not itemized, the planner enters a budget figure (in dollars) for the ship stores material that the key shop is expected to expend on each key operation. Then the job order and material list are sent to the production department, where the repair division adds key operation dates and the material required dates (MRDs).

The planning department prepares allowance lists (lists of equipment components, repair parts, or material necessary for proper operation, maintenance, and repair of the ship for specified periods of time) for newly constructed ships. It also corrects existing allowance lists for ships for which the shipyard is the home yard. The plans, material requisitions, or individual job orders pertinent to the ship's equipment are the sources from which the necessary information is obtained to prepare or correct the COSAL. It is necessary to reflect removals as well as additions or replacements of equipment. Information on each item listed is given in sufficient detail to ensure the identity of the item and to facilitate reordering.

Submission of Work Requests

The procedures for submitting shipyard work requests prior to a regular overhaul are found in OPNAV instructions and are specified in detail in regulations issued by fleet commanders and type commanders.

Type commanders require that work requests for work to be accomplished during a regular overhaul be submitted for their inspection, screening, and approval in sufficient time to allow completion of the type commander's action and arrival of the work requests at the shipyard 60 days in advance of commencement of the overhaul. This action is necessary to permit successful preliminary planning by the shipyard.

Each work request is submitted on a standard work request form (OPNAV 4790/2K). All work requests are screened and assigned a priority for accomplishment at a conference consisting of the heads of department, the executive officer, and the commanding officer. A work list containing brief statements of the work to be accomplished, arranged in the ship's integrated priority sequence, is prepared and submitted along with the work requests to the type commander for screening action. Following the screening action, the type commander forwards the approved requests to the naval shipyard or SUPSHIP, as appropriate.

It may be necessary to prepare supplementary work requests to include items arising after the submission of the original work requests. Additional repairs may be required because of voyage casualties or because of conditions discovered during shipyard tests and inspections. The supplementary work requests must be submitted following the same procedure used for submitting the original work requests, and the supplementary items must be dovetailed into the ship's priority index.

Supplementary work requests should be made out immediately, as soon as the need becomes evident, and submitted to the yard as soon as possible after they have been prepared.

Arrival Conference

Upon arrival of a ship at a shipyard, an arrival conference is held to discuss the work requested by the ship. This conference normally is conducted by the commanding officer of the shipyard and attended by the commanding officer of the ship, by representatives of the repair activity and of the ship, and of such other commands and authorities as the circumstances may justify.

The commanding officer of the shipyard reviews the ship's work requests and the individual item costs estimated by the shipyard planning department. When necessary, the details of the repair items are discussed, and the work to be done is decided upon. If, in the opinion of the commanding officer of the shipyard, any significant changes pertaining to the items listed are advisable, appropriate recommendation must be made to include pertinent comments of the commanding officer of the ship, to the grantor of the availability.

The limitations of the funds made available by the type commander determine, to a great extent, the amount of repairs that will be accomplished during a naval shipyard overhaul period. When approved at the conference, the estimated cost of each repair job is calculated to give the total cost. When the total cost reaches approximately the amount of funds appropriated, or the cutoff point, the shipyard will not accept additional repair requests. Under this condition, when there are several additional important jobs that should be accomplished, the type commander must either furnish more funds or rearrange the individual items in question and revise the priority list.

Establishing the cutoff point enables the shipyard to make certain that the most important repairs and alterations are done during the availability period. This does not necessarily imply that other items with less urgent priority will not be undertaken and accomplished before the end of the overhaul period. After the ship has been placed in dry dock, for example, it may be found that anticipated repairs to the shafting and propeller will not be required, and the funds reserved for this work can be used to finance other items. Sometimes a job may be seriously underestimated because of conditions that were not apparent until the job was well underway. If funds were not originally provided to cover the cost of the work, the necessary funds may now be provided by deferring other approved items of less relative importance.

Checking Off Work Progress

During a routine shipyard overhaul, the ship must submit shipyard progress reports by following the type commander's instructions. Supervisory personnel of the ship must therefore keep an accurate check on the progress of all work (including the ship's force work) at all times. Standard progress charts are available for recording and reporting progress. As a rule, one progress chart is used to record shipyard repairs, another is used to record alterations, and another is used to record the ship's force work. Copies of the progress charts should be posted outside the weapons office and kept up to date by the ship's personnel assigned.

The shipyard commander holds frequent (usually weekly) conferences with the commanding officer of the ship to review progress. The ship superintendent and other key shipyard personnel also attend these conferences.

In checking on the progress of work, it is necessary to know what repair work is planned for accomplishment during the overhaul. This information can be obtained from the job orders issued by the planning department of the yard. The ship receives three or more copies of the job orders. A complete set of job orders is usually kept on file in the log room; a set of the job orders that apply to a particular division is usually kept by the division officer.

Checking Off Job Orders

The inspection of work being done by a repair activity for a ship is the responsibility of both the repair activity and the ship. The repair activity should require such inspections to be made as will ensure the proper execution of the work and adherence to prescribed specifications and methods. The ship's personnel should make such inspections, as may be necessary, to determine if the work is satisfactory, both during its progress and when completed.

During the ending period of a yard overhaul, daily complete inspections of all spaces should be mandatory for yourself as well as for your division officers. You should take paper, pencil, and flashlight with you and record even the slightest discrepancy. Of course, this should have been done frequently during the overhaul itself to keep abreast of job completion and to note discrepancies. Those found at that time could be corrected in the yard. The ones you find now most likely will be small but should be corrected during your weekly maintenance schedule.

The signing off of job orders is done only by authorized personnel after all specifications have been met.

Planning, Paper Work, and Records

If you have planned correctly and carried out those plans during the overhaul period, there should be no major long-term adjustments to be made in the planning area. Training schedules should have been worked out by this time, and posted, and the ship's training, operating, and maintenance cycle started to function again.

Paper work directly related to the yard overhaul should be close to completion, if not terminated; for example, the Post Overhaul SAIL and the completed deferred actions. The major paper work confronting you now will be that concerning ammunition on loading, verification of custody cards, and allocation of your portion of the ship's operating target allowance (OPTAR) funds.

Records should be brought up to date, and the 3-M cycle schedule (quarterly and weekly) and shipboard training commenced.

Readiness-for-Sea Status (RFS) Period

Upon completion of the regular overhaul, the ship usually goes into a RFS of approximately 7 days. This period may be varied by the type commander as necessary, but the basic purpose of the RFS period is to provide the commanding officer with sufficient time to prepare the ship for sea.

REFERENCE LIST

ASW Weapon System Accuracy Trials Program for Surface Ships, OD 40087, Naval Sea Systems Command, Washington, D.C.

Combat System Alignment Total DD-963 Class, Technical Manual, SW225-B3-CSA-010, Naval Sea Systems Command, Washington, D.C.

Combat System Ship Qualification Trials (CSSQT) for Surface Ships; Policies, Objectives, and Procedures for, NAVSEAINST 9093.1, Naval Sea Systems Command, Washington, D.C., November 1979.

Engineering Administration, NAVEDTRA 10858-F, Naval Education and Training Command, Pensacola, Fla.

Launching Group Mk 16 Mod 4, OD 10729, Naval Sea Systems Command, Washington, D.C.

Lubrication of Ordnance Equipment, OD 3000, Naval Sea Systems Command, Washington, D.C.

Material Inspections of Ships Conducted by the Board of Inspection and Survey, OPNAVINST 4730.5J, Office of The Chief of Naval Operations, Washington, D.C., January 1978.

Mission, Organization and Functions of the Board of Inspection and Survey, OPNAVINST 5420.70, Office of the Chief of Naval Operations, Washington, D.C., April 1971.

Preparation of Deficiency Forms, INSURVINST 4730.11E, President, Board of Inspection and Survey, Washington, D.C., August 1972.

Reports of Trials, Material Inspections and Surveys Conducted by the Board of Inspecion and Survey, INSURVINST 4730.8E, President, Board of Inspection and Survey, Washington, D. C., September 1972.

SECAS Programs Manual, Volume 4 Shipboard Operations, T0752—AA-MAN-0401 SECAS, Naval Sea Systems Command, Washington, D.C., January 1982.

Ships' 3-M Manual, OPNAVINST 4790.4, Office of the Chief of Naval Operations, Washington, D.C., September 1983.

Standard Organization and Regulations of the U.S. Navy, OPNAVINST 3120.32A, Office of the Chief of Naval Operations, Washington, D.C., March 1979.

Surface Ship ASW SYS W/FC5 MK 114 Sonar Detecting Ranging Set AN/SQS-23, OP 2983, Naval Sea Systems Command, Washington, D.C.

Theory of Combat System Alignment, SW225-AO-MMA-010/OP762, Naval Sea Systems Command, Washington, D.C.

Trials and Associated Inspections of Surface Ships, INSURVINST 9080.2G, President, Board of Inspection and Survey, Washington, D.C., October 1979.

CHAPTER 5

SUPPLY PROCEDURES

Problems in supply support are frequently listed among the major causes of headaches for weapons officers. Fortunately, the problems lend themselves to a simple and effective solution. An understanding of the role of an afloat supply department and your place in the supply machinery will not only eliminate the headaches, it will also make simpler the technical aspects of your job as weapons officer. The purpose of this chapter is to familiarize you with the workings of the supply department aboard your ship so you may take full advantage of the possibilities offered by the naval supply system and, thereby, discharge more effectively your responsibilities as weapons officer.

TYPES OF MATERIALS

The Navy divides its material into four categories: equipment, equipage, repair parts, and consumables and services.

EQUIPMENT

Equipment is any functional unit of hull, mechanical, electrical, ordnance, or electronic-type material that is operated either singly or as a component of a system or subsystem; it is identified by a component identification number (CID), a numerical control code (NCC), an allowance parts list (APL), or other similar designation. Examples of equipment are the ship's radar, the drive assembly for a 5-inch ammunition hoist, and the tube of a Mk 32 surface vessel torpedo mount.

EQUIPAGE

Equipage refers to those items that require management control because of high unit cost, vulnerability to pilferage, and/or essentiality to the ship's mission, or a combination of those factors. Equipage does not encompass installed mechanical, electrical, ordnance, or electronic equipments, components, or systems. Equipage items generally are identifiable to end-use applications aboard ships to the extent that an allowed quantity of the item can be determined on an individual ship basis. Refer to NAVSUP P-485, chapter 3, for the definitions of controlled and other equipage.

Controlled equipage refers to those items of equipage that require special management control because the material is (1) essential for the protection of life or (2) relatively valuable and easily convertible to personal use (life jackets, binoculars, and so forth). These items are generally carried on board ship in allowance quantities and require special inventory control.

A large number of items are listed on allowance equipage lists (AELs) that are not designated as controlled equipage. Such material is known simply enough as other equipage, and it does not require special inventory control procedures. Everyday examples include projection screens, pennants, furniture, and fuel hoses.

REPAIR PARTS

Repair part refers to any item, including modules and consumable-type materials, which has an equipment application and appears in an APL, stock number sequence list, or an integrated stock handbook.

CONSUMABLES AND SERVICES

Consumables refers to administrative and housekeeping items, common tools, paints, cognizance symbol 1I forms, or any other item not specifically defined as equipage or repair parts. Materials, such as general purpose hardware, metals, lumber and lubricating oil, are also considered to be consumables in procurement but are treated as repair parts when the material is to be used for maintenance actions. Services are nonmaterial requirements, such as equipment rental, commercial telephone, pilotage, and tug hire. For accounting purposes, both services and equipage not designated as controlled equipage are reported as consumables.

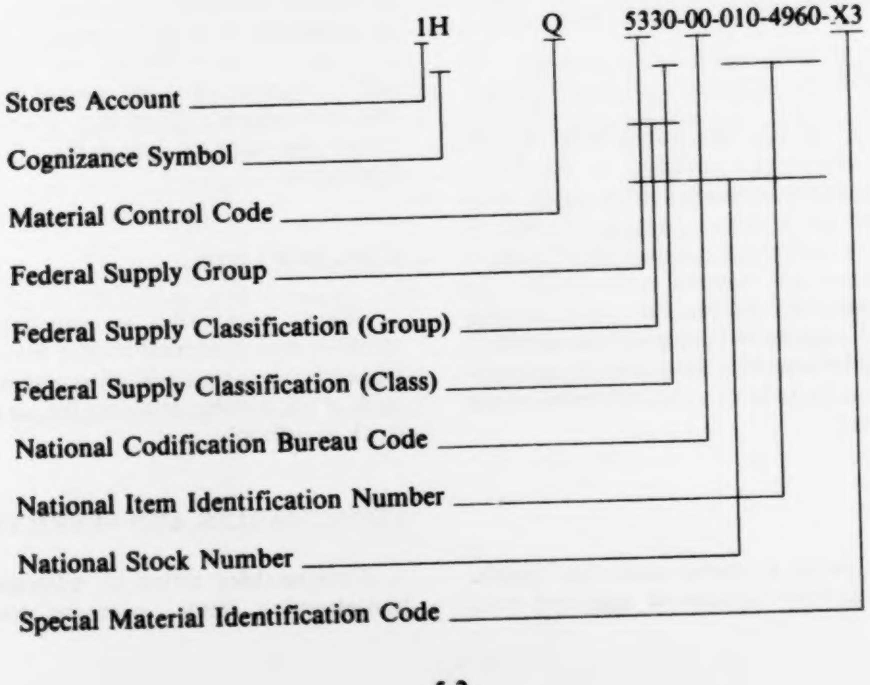
You may wonder why there is so much fuss about defining types of material. Typically, type commanders allocate funds by categories; X dollars for repair parts, Y dollars for controlled equipage, and Z dollars for consumables. Such categorization is important to you as a department head, because in most commands you will be budgeted funds only for consumables, with the supply department (under the commanding officer's control) reserving funds to pay for all repair parts and controlled equipage. You must, therefore, ensure that APL and equipment identification code (EIC) numbers be included on the request document for every item appearing on an APL used in a repair action so that it will not be charged against the funds of your department.

IDENTIFICATION

The fact that the supply system is a kingdom of numbers and the user needs material (not numbers) may give rise to conflict between the two unless each user makes some effort to appreciate the ground rules of the other. You can advance your own interest considerably by learning some basics about the numerical language that you use to communicate your requirements to supply. The Navy and other agencies of the federal government have adopted one standardized system of classification and identification for the materials they use. Under the Federal Supply Classification (FSC) System, most material used by the Navy is assigned a 13-digit national stock number (NSN). Given a correct stock number, supply personnel can usually locate detailed information on any item of standard stock.

BREAKDOWN OF NATIONAL STOCK NUMBERS (NSN)

An NSN is a 13-digit number. It consists of a four-digit federal supply classification (FSC-groups and class) and a nine-digit national item identification number (NIIN). The NIIN consists of a two-digit national codification bureau (NCB) code (discussed later) and seven digits which, in conjunction with the NCB code, identify each NSN item in the federal supply system. The following example illustrates all of the elements of the NSN in their proper sequence.


1H
Q
5330-00-010-4960-X3
Stores Account
Cognizance Symbol
Material Control Code
Federal Supply Group
Federal Supply Classification (Group)
Federal Supply Classification (Class)
National Codification Bureau Code
National Item Identification Number
National Stock Number
Special Material Identification Code

COGNIZANCE SYMBOL

A two-part cognizance symbol is used within the Navy to provide supply information. Currently, there are 94 of these symbols in use. Most of the transactions aboard ship are covered by symbols 1H, 9C, 9G, 9N, 9Q, and 9Z. The first part of the symbol is a single number that denotes the store's account in which the material is carried in the supply system. Briefly, the numerical part of the symbol indicates the following:

- Material held in the Navy stock account (NSA). When this material is issued, it must be paid for by the requisitioner—1, 3, 5, or 7.
- Material purchased by the defense stock fund and held in NSA. When this material is issued, it must be paid for by the requisitioner—9.
- Material held in the appropriations purchases account or nonstores account. This material is issued without charge to the requisitioner—2, 4, 6, or 8. (Requisitioner pays for all odd number cog items but not for even cog numbers.)

The second part of the cognizance symbol is a single-letter code that designates the inventory control point and the inventory control manager of the material.

STOCK GROUPS AND CLASSES

The Federal Supply Classification System divides all material into numbered groups and classes that indicate the general nature of the material. They are of little significance to the user, and you are well advised to spend time available for study of the supply system on other matters.

NATIONAL ITEM IDENTIFICATION NUMBER (NIIN)

The NIIN is a nine-digit number that identifies each item in the supply system used by the Department of Defense. The NIIN indexes or relates to identification data that makes an item of supply different from another item. The amount and type depend on its intended use. Although the NIIN is part of the NSN, it is used independently to identify an item. Except for identification lists, most federal supply catalogs are arranged in an NIIN order.

The NIIN is the foundation on which your entire discourse with supply sources is based. Accuracy is desirable in any communication to supply; it is absolutely essential in transmitting NIINs. If you make an error in transcribing the cognizance symbol or the group and class of an item, it will probably be detected and corrected. If, on the other hand, you should err in transmitting the NIIN to supply, you may well end up with a piece of anchor chain instead of an electrical resistor.

PUBLICATIONS

The chief publications your department will use aboard ship in identifying material are the coordinated shipboard allowance list (COSAL); the manufacturers' publications, such as technical manuals and catalogs; and the technical bureau or systems command publications.

Most identification publications have notes or introductions that explain fully how to use the publication. These publications can be rather complex, and should you or anyone in your department have trouble in deciphering the various codes or reference numbers, supply department personnel will be glad to help. Your clear understanding of identification publications makes the job in supply a lot easier.

ALLOWANCE LISTS

Allowance list is, except for equipage and equipment, a misnomer. You cannot expect to find in the supply department storerooms every item in the quantity appearing on allowance lists. Where funds are available at the TYCOM level, there will generally be a high correlation between allowed quantities of repair parts and the presence of such repair parts in storage bins. In any event, the allowed quantity for repair parts may not be exceeded unless the higher quantity is supported by valid usage data or with the approval of the type commander. Allowed quantities of consumables are guides to the range and quantities of material that represent a best guess as to the operational requirements of a given ship type. Typically, a ship will emerge from an outfitting with these quantities on board, but will adjust its stock levels of consumables according to the usage data, with occasional adjustment to reflect abnormalities in its operating schedule.

Your major use of allowance lists will be as a primary means of identifying to an NSN the part that you need, such as an ammunition hoist. The allowance list you will use most frequently is the COSAL, which is hull, mechanical, electrical, ordnance, and electronic (HMEO&E) equipment. Its use will be detailed in the following paragraphs. Other COSALs have a similar format. If you have a firm grasp of the HMEO&E COSAL and read the introductory sections of the COSAL, you should have no difficulty in using them.

HMEO&E COSAL

The HMEO&E COSAL is prepared by the Ship Parts Control Center (SPCC), the Navy Fleet Material Support Office, and the Naval Publications and Forms Center. It lists the operating equipments, repair parts, and equipage installed aboard ships. Each ship in the Navy has its own individual COSAL, which is tailored specifically to the equipment and equipage installed on that particular ship. The COSAL lists the repair parts necessary to support each equipment and equipage item installed aboard the ship, and it specifies which and how many of these repair parts will be carried aboard ship. The COSAL also contains valuable technical information, such as the nameplate data of the equipments and a cross-reference of the manufacturers' part numbers to the national stock numbers.

The proper use of the COSAL is important to personnel in all departments aboard ship. Before attempting to use the COSAL, you should study its introduction, which contains general instructions for its use and maintenance. As with any other technical publication, you must understand the COSAL's format to derive full use from the data that it contains.

The COSAL publication is divided into parts and sections as follows:

1. Part I
    a. Summary of Effective Allowance Part/Equipage List (SOEAPL)
    b. Index—Section A
    c. Index—Section B
    d. Index—Section C
    e. Index—Section D
    f. Index—Section E
2. Part II
    a. Section A—Allowance parts lists (APLs)
        *Bald APLs
        *Allowance components list (ACL)
        *Miscellaneous APL—89000 series
    b. Section B—Circuit symbol number (CSN)
    c. Section C—Allowance equipage lists (AELs)
3. Part III
    a. Section A. Storeroom Item (SRI) Stock Number Sequence List (SNSL)
    b. (For Overhaul Ships)—Integrated Stock List (ISL)
    c. Section B. Operating Space Items (OSIs) Stock Number Sequence List (SNSL)
    d. Section CF. SNSL Maintenance Assistance Modules
    e. Section CR. SNSL Ready Service Spares
    f. Old to New Stock Number Cross-Reference List
    g. Section D. Alternate Number Cross-Reference to Stock Number List
    h. Section E. Generally used, consumable, nonequipment-related items; for initial outfitting of a ship's operating spaces and storerooms.

Part I, Summary of Effective Allowance Parts/Equipage Lists (SOEAPL)

This section is a numerical sequence listing, by identification number, of allowance parts lists (APLs), allowance equipage lists (AELs), and allowance component lists (ACLs) in part II of the COSAL. (See figure 5-1.)

Sections A and B of part I contain exactly the same information except that the sequence by which the information is listed is different.

Section A is arranged in ALPHA sequence by noun name and partial characteristic description of each APL, AEL, and ACL.

Section B is arranged in sequence by service application. (See figures 5-2 and 5-3.)

COSAL index sections C, D, and E are used primarily by maintenance personnel. For detailed information and illustrations of these sections, refer to SPCCINST 4441.170, chapter 3, *The COSAL Use and Maintenance Manual.*

Part II, Section A

This section of the COSAL contains allowance parts lists. Separate APLs are prepared for each different piece of equipment on board ship and for each major component in each piece of equipment. The APL lists all the repair parts

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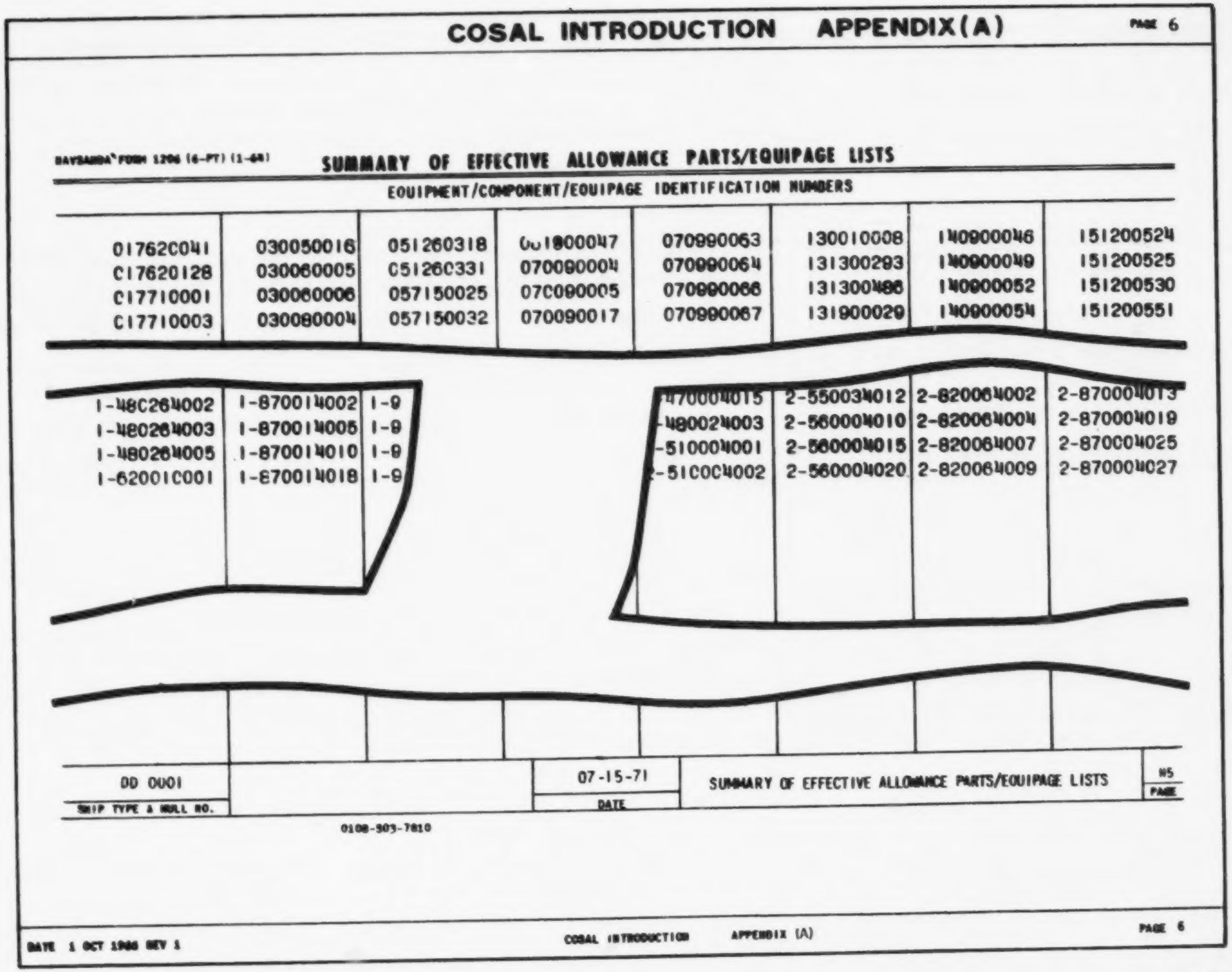
*Apply only to COSALs issued after 1978.



COSAL INTRODUCTION APPENDIX(A) PAGE 6

NAVSANDA FORM 1206 (6-PT) (1-68)

SUMMARY OF EFFECTIVE ALLOWANCE PARTS/EQUIPAGE LISTS

EQUIPMENT/COMPONENT/EQUIPAGE IDENTIFICATION NUMBERS

01762C041	030050016	051260318	061800047	070990063	130010008	140900046	151200524
C17620128	030060005	C51260331	070090004	070990064	131300293	140900049	151200525
C17710001	030060006	057150025	07C090005	070990066	131300486	140900052	151200530
C17710003	030080004	057150032	070090017	070990067	131900029	140900054	151200551
1-48C264002	1-870014002	1-9		470004015	2-550034012	2-820064002	2-870004013
1-480264003	1-870014005	1-9		-480024003	2-560004010	2-820064004	2-870004019
1-480264005	1-870014010	1-9		-510004001	2-560004015	2-820064007	2-870004025
1-62001C001	1-870014018	1-9		-51C0C4002	2-560004020	2-820064009	2-870004027

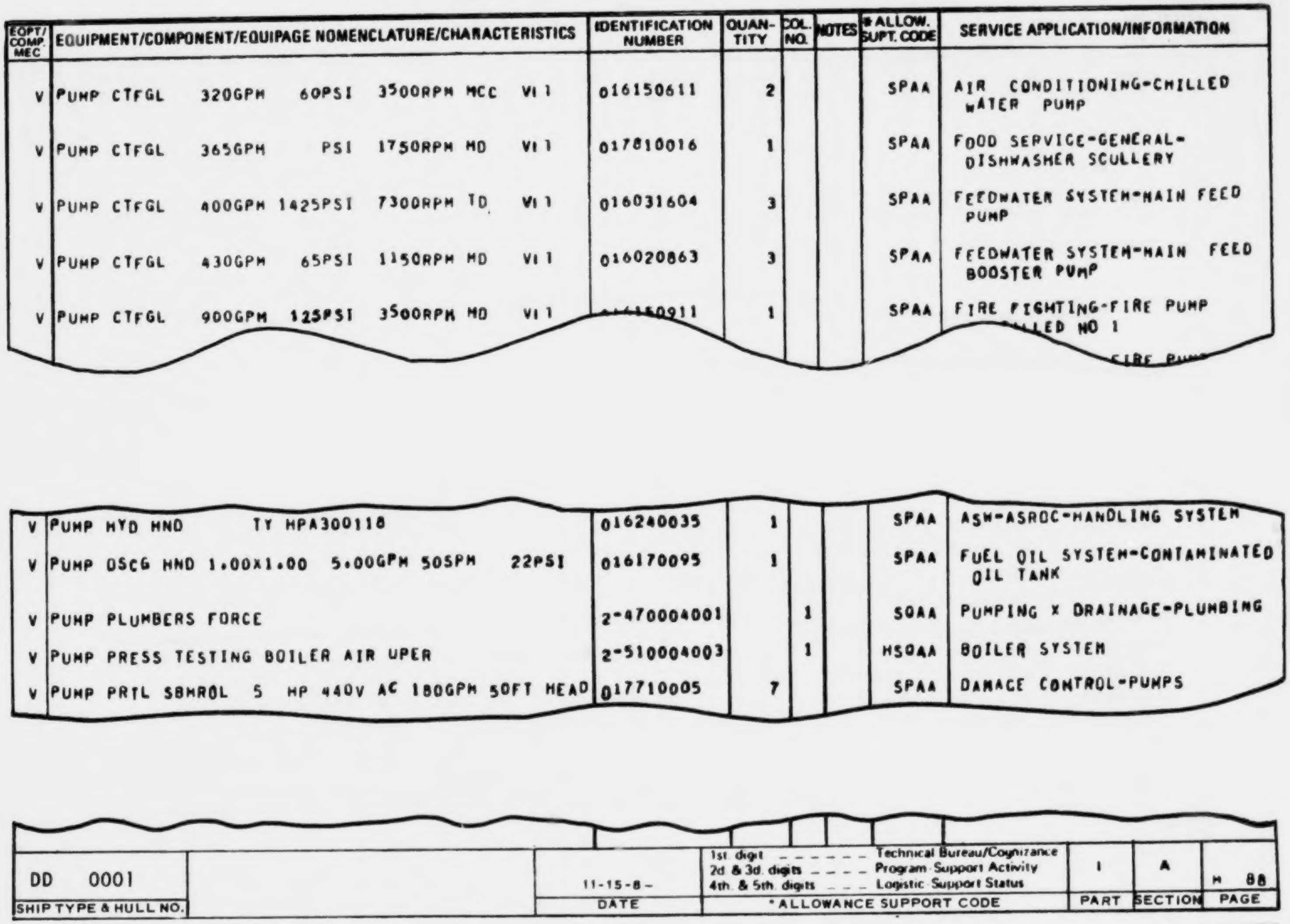
DD 0001		07-15-71	SUMMARY OF EFFECTIVE ALLOWANCE PARTS/EQUIPAGE LISTS	45
SHIP TYPE & HULL NO.		DATE		PAGE

0108-303-7810

DATE 1 OCT 1966 REV 1 COSAL INTRODUCTION APPENDIX (A) PAGE 6

63.85

Figure 5-1.—Summary of Effective Allowance Parts/Equipage Lists (SOEAPL).



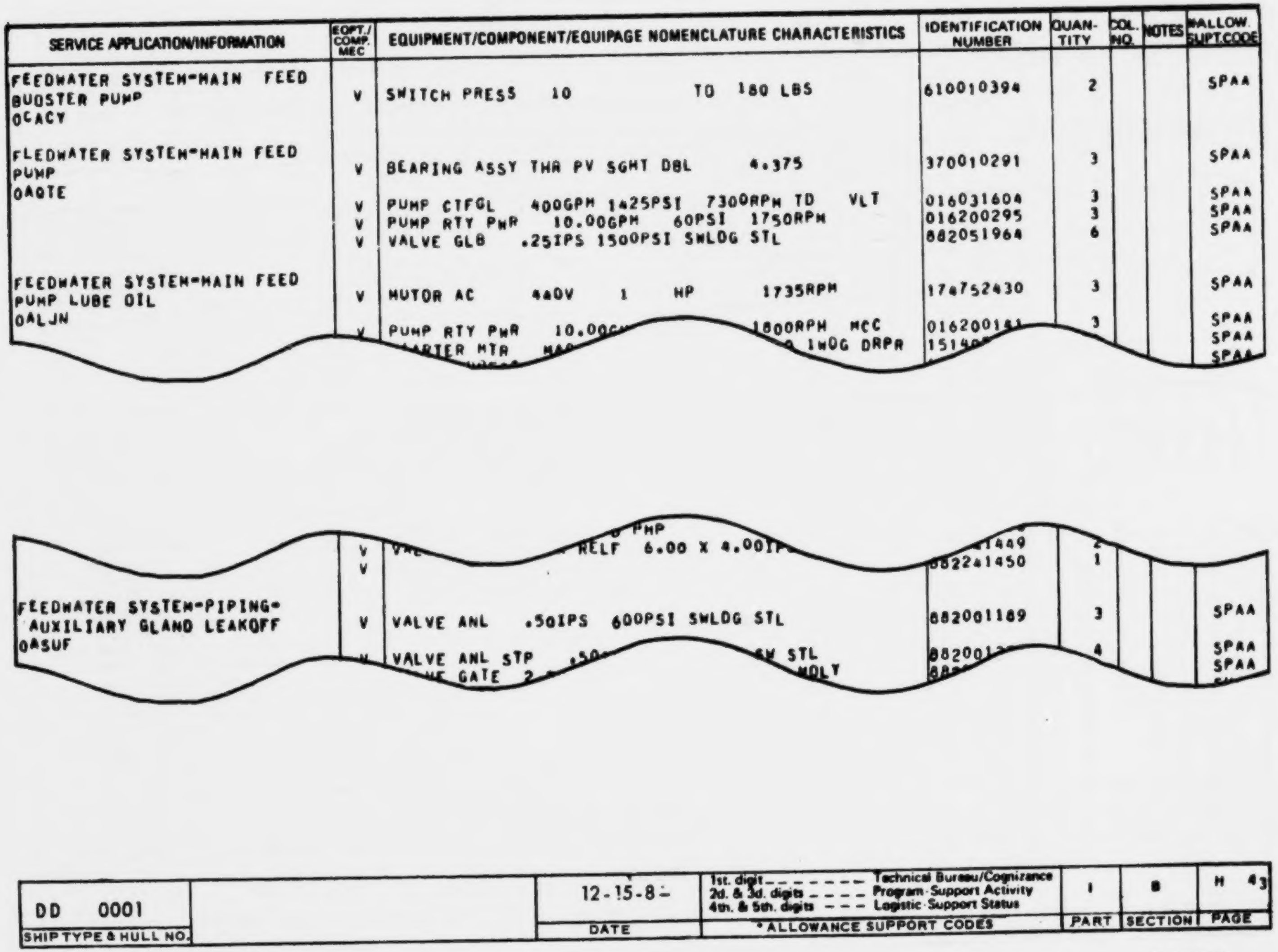
EQPT/ COMP. MEC	EQUIPMENT/COMPONENT/EQUIPAGE NOMENCLATURE/CHARACTERISTICS	IDENTIFICATION NUMBER	QUAN-TITY	COL. NO.	NOTES	* ALLOW. SUPT. CODE	SERVICE APPLICATION/INFORMATION
V	PUMP CTFGL 320GPM 60PSI 3500RPM MCC VI 1	016150611	2			SPAA	AIR CONDITIONING-CHILLED WATER PUMP
V	PUMP CTFGL 365GPH PSI 1750RPM MD VI 1	017810016	1			SPAA	FOOD SERVICE-GENERAL-DISHWASHER SCULLERY
V	PUMP CTFGL 400GPM 1425PSI 7300RPM TD VI 1	016031604	3			SPAA	FEEDWATER SYSTEM-MAIN FEED PUMP
V	PUMP CTFGL 430GPM 65PSI 1150RPM MD VI 1	016020863	3			SPAA	FEEDWATER SYSTEM-MAIN FEED BOOSTER PUMP
V	PUMP CTFGL 900GPM 125PSI 3500RPM MD VI 1	0911	1			SPAA	FIRE FIGHTING-FIRE PUMP LLED NO 1 FIRE PU

EQPT/ COMP. MEC	EQUIPMENT/COMPONENT/EQUIPAGE NOMENCLATURE/CHARACTERISTICS	IDENTIFICATION NUMBER	QUAN-TITY	COL. NO.	NOTES	* ALLOW. SUPT. CODE	SERVICE APPLICATION/INFORMATION
V	PUMP HYD HND TY HPA300118	016240035	1			SPAA	ASW-ASROC-HANDLING SYSTEM
V	PUMP OSCG HND 1.00X1.00 5.00GPM 50SPM 22PSI	016170095	1			SPAA	FUEL OIL SYSTEM-CONTAMINATED OIL TANK
V	PUMP PLUMBERS FORCE	2-470004001		1		SOAA	PUMPING X DRAINAGE-PLUMBING
V	PUMP PRESS TESTING BOILER AIR UPER	2-510004003		1		MSOAA	BOILER SYSTEM
V	PUMP PRTL SBMROL 5 HP 440V AC 180GPM 50FT HEAD	017710005	7			SPAA	DAMAGE CONTROL-PUMPS

DD 0001		11-15-8-	1st digit ------ Technical Bureau/Cognizance 2d & 3d digits ---- Program Support Activity 4th & 5th digits --- Logistic Support Status	I	A	M 88
SHIP TYPE & HULL NO.		DATE	* ALLOWANCE SUPPORT CODE	PART	SECTION	PAGE

123.187

Figure 5-2.—COSAL Index, Part 1, Section A.



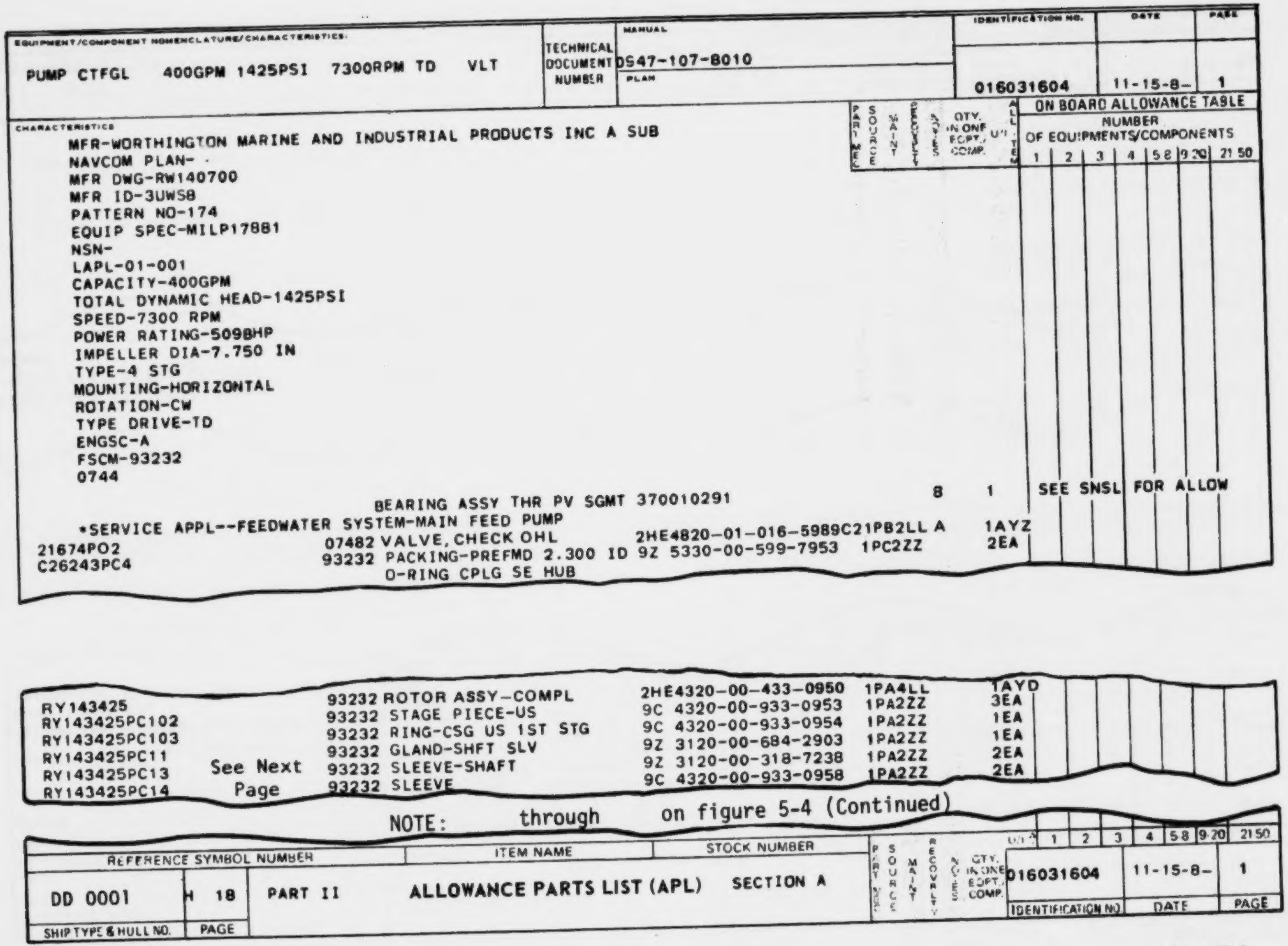
SERVICE APPLICATION/INFORMATION	EQPT./COMP. MEC	EQUIPMENT/COMPONENT/EQUIPAGE NOMENCLATURE CHARACTERISTICS	IDENTIFICATION NUMBER	QUAN-TITY	COL. NO.	NOTES	*ALLOW. SUPT.CODE
FEEDWATER SYSTEM-MAIN FEED BOOSTER PUMP 0CACY	V	SWITCH PRESS 10 TO 180 LBS	610010394	2			SPAA
FLEDWATER SYSTEM-MAIN FEED PUMP 0AQTE	V	BEARING ASSY THR PV SGHT DBL 4.375	370010291	3			SPAA
	V	PUMP CTFGL 400GPM 1425PSI 7300RPM TD VLT	016031604	3			SPAA
	V	PUMP RTY PWR 10.00GPM 60PSI 1750RPM	016200295	3			SPAA
	V	VALVE GLB .25IPS 1500PSI SWLDG STL	882051964	6			SPAA
FEEDWATER SYSTEM-MAIN FEED PUMP LUBE OIL 0ALJN	V	MOTOR AC 440V 1 HP 1735RPM	174752430	3			SPAA
	V	PUMP RTY PWR 10.00G 1800RPM MCC	0162001	3			SPAA
		ARTER MTR MAG 1WOG DRPR	1514				SPAA
							SPA

		PMP					
	V	VAL RELF 6.00 X 4.00I	1449	2			
	V		882241450	1			
FEEDWATER SYSTEM-PIPING- AUXILIARY GLAND LEAKOFF 0ASUF	V	VALVE ANL .50IPS 600PSI SWLDG STL	882001189	3			SPAA
		VALVE ANL STP .50 SW STL	88200	4			SPAA
		GATE 2 MOLY	88				SPAA

DD 0001		12-15-8-	1st. digit - - - - - - - - Technical Bureau/Cognizance 2d. & 3d. digits - - - - Program-Support Activity 4th. & 5th. digits - - - Logistic-Support Status	1	B	H 43
SHIP TYPE & HULL NO.		DATE	*ALLOWANCE SUPPORT CODES	PART	SECTION	PAGE

123.187.1

Figure 5-3.—COSAL Index, Part 1, Section B.



EQUIPMENT/COMPONENT NOMENCLATURE/CHARACTERISTICS:

PUMP CTFGL 400GPM 1425PSI 7300RPM TD VLT

TECHNICAL DOCUMENT NUMBER: MANUAL 0S47-107-8010; PLAN

IDENTIFICATION NO.: 016031604

DATE: 11-15-8-

PAGE: 1

CHARACTERISTICS

MFR-WORTHINGTON MARINE AND INDUSTRIAL PRODUCTS INC A SUB
NAVCOM PLAN-
MFR DWG-RW140700
MFR ID-3UWS8
PATTERN NO-174
EQUIP SPEC-MILP17881
NSN-
LAPL-01-001
CAPACITY-400GPM
TOTAL DYNAMIC HEAD-1425PSI
SPEED-7300 RPM
POWER RATING-509BHP
IMPELLER DIA-7.750 IN
TYPE-4 STG
MOUNTING-HORIZONTAL
ROTATION-CW
TYPE DRIVE-TD
ENGSC-A
FSCM-93232
0744

PART MEC | SOURCE | MAINT | RECOVERY | NOTES | QTY. IN ONE EQPT./COMP. | U/I | ALLOW ITEM

ON BOARD ALLOWANCE TABLE
NUMBER OF EQUIPMENTS/COMPONENTS
1 | 2 | 3 | 4 | 5 8 | 9 20 | 21 50

BEARING ASSY THR PV SGMT 370010291 8 1 SEE SNSL FOR ALLOW

*SERVICE APPL--FEEDWATER SYSTEM-MAIN FEED PUMP
21674PO2 07482 VALVE, CHECK OHL 2HE4820-01-016-5989C21PB2LL A 1AYZ
C26243PC4 93232 PACKING-PREFMD 2.300 ID 9Z 5330-00-599-7953 1PC2ZZ 2EA
O-RING CPLG SE HUB

RY143425 93232 ROTOR ASSY-COMPL 2HE4320-00-433-0950 1PA4LL 1AYD
RY143425PC102 93232 STAGE PIECE-US 9C 4320-00-933-0953 1PA2ZZ 3EA
RY143425PC103 93232 RING-CSG US 1ST STG 9C 4320-00-933-0954 1PA2ZZ 1EA
RY143425PC11 93232 GLAND-SHFT SLV 9Z 3120-00-684-2903 1PA2ZZ 1EA
RY143425PC13 93232 SLEEVE-SHAFT 9Z 3120-00-318-7238 1PA2ZZ 2EA
RY143425PC14 93232 SLEEVE 9C 4320-00-933-0958 1PA2ZZ 2EA

See Next Page

NOTE: through on figure 5-4 (Continued)

REFERENCE SYMBOL NUMBER		ITEM NAME	STOCK NUMBER	PART MEC / SOURCE / MAINT / RECOVERY / NOTES	QTY. IN ONE EQPT./COMP. U/I	1	2	3	4	5-8	9-20	21-50

SHIP TYPE & HULL NO.	PAGE			IDENTIFICATION NO.	DATE	PAGE
DD 0001	H 18	PART II	ALLOWANCE PARTS LIST (APL) SECTION A	016031604	11-15-8-	1

123.187.2

Figure 5-4.—Allowance Parts List.

installed in the piece of equipment/component to which it applies. (See figure 5-4.)

Part II, Section B

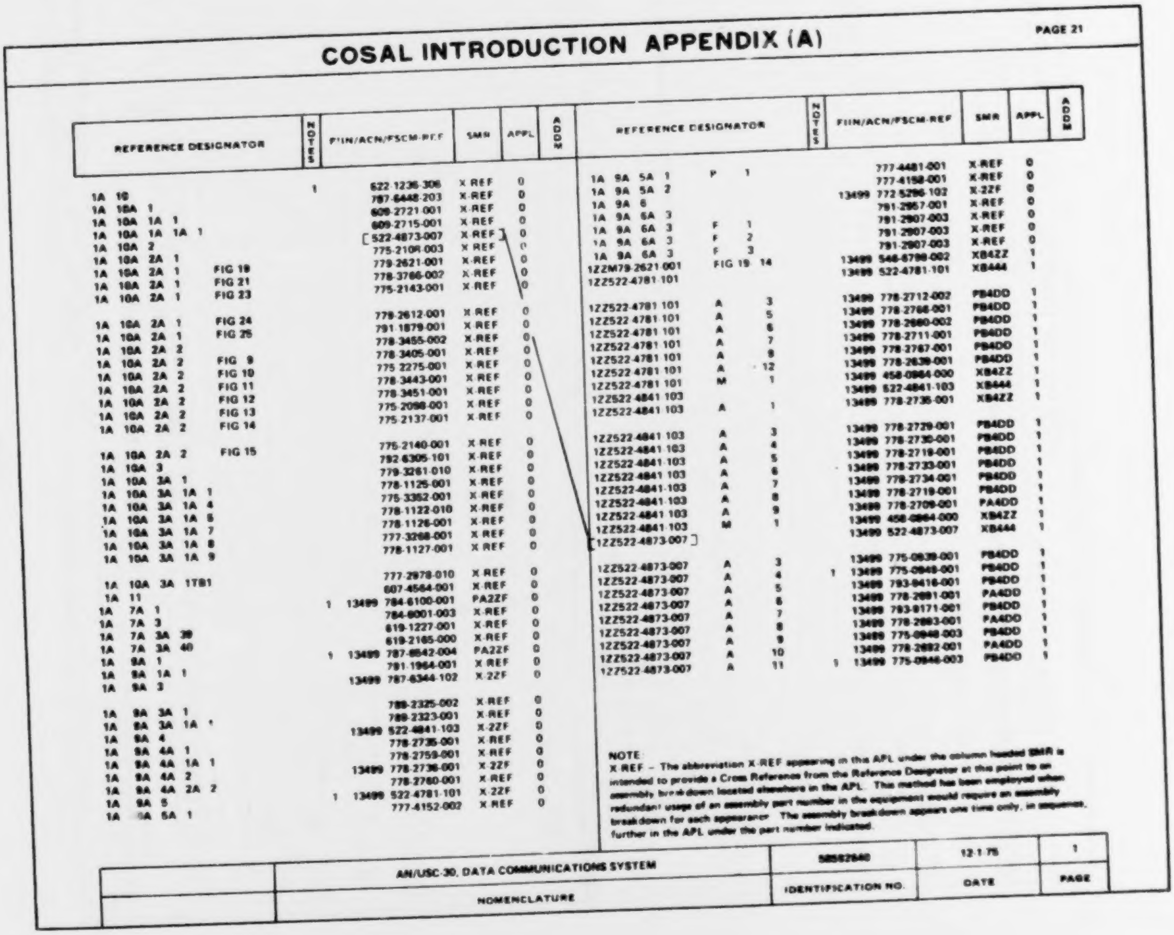
This section contains the circuit symbol number lists (CSNLs), which are also called reference symbol numbers (RSNs). A combination of letters and numbers are used in drawings, diagrams, schematics, technical manuals, and so forth to identify electronic parts. (See figure 5-5.)

Part II, Section C

This section contains the allowance equipage lists (AELs). AELs are prepared for various categories of equipage or for operating systems. When an AEL is used for a system, it will include the items required for the operation of that system. The items described in an AEL are generally operating space part items (OSI) that are in the custody of various shipboard departments. COSAL AELs are identified by a nine-digit number, preceded by a numeric (0–7) and a dash (-), and are further compiled in a document/sequence number. (See figure 5-6.)

Part III, Section A

This section contains the authorized allowance quantities of repair parts and equipment-related consumables for support of the installed, onboard equipment listed in part I, COSAL. It lists them in an NIIN or Navy Item Control Number (NICN) sequence. (See figure 5-7.)



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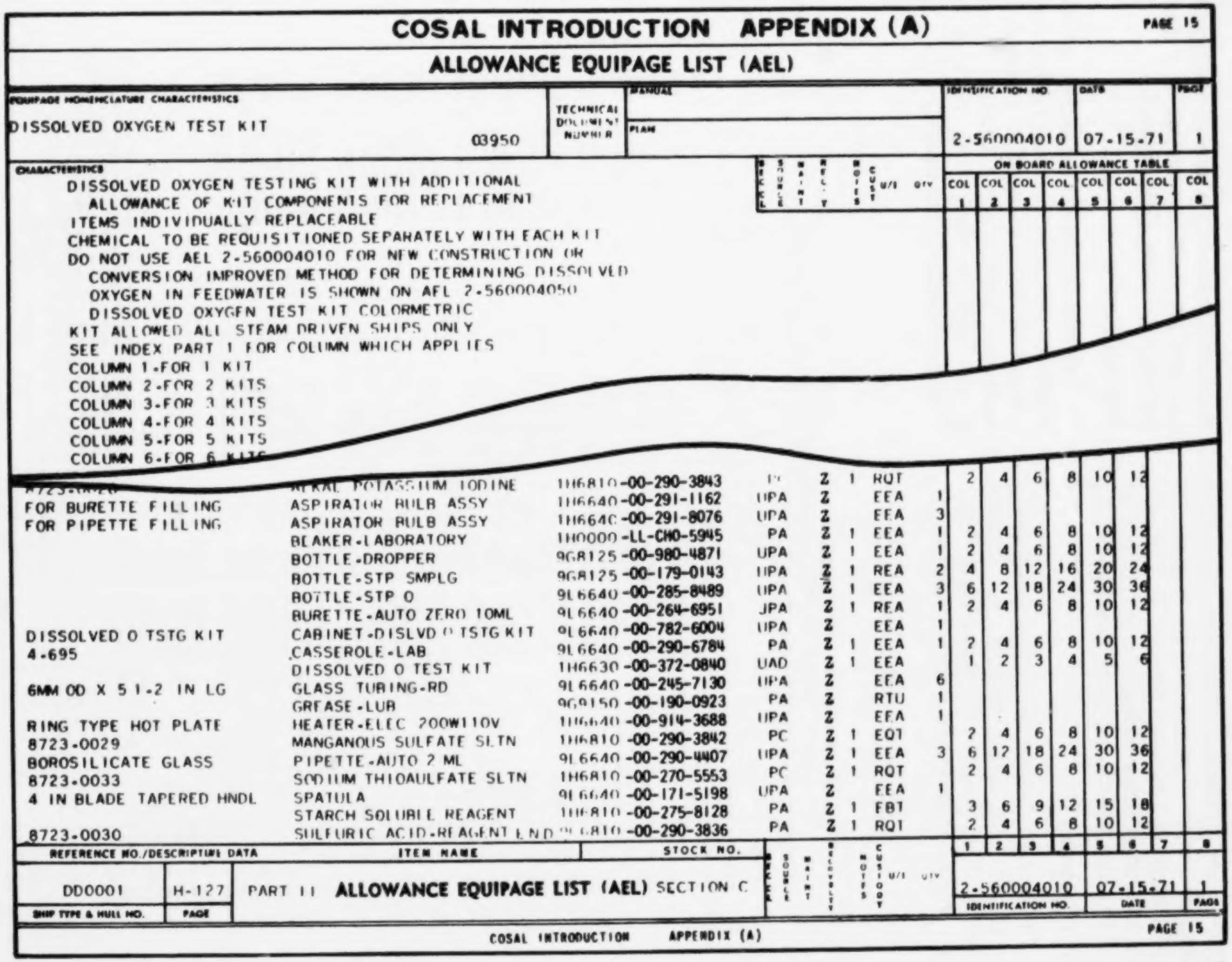
REFERENCE DESIGNATOR	NOTES	FIIN/ACN/FSCM-REF	SMR	APPL	ADDM
1A 10	1	622-1236-306	X-REF	0	
1A 10A 1		787-6448-203	X-REF	0	
1A 10A 1A 1		609-2721-001	X-REF	0	
1A 10A 1A 1A 1		609-2715-001	X-REF	0	
1A 10A 2		[522-4873-007	X-REF]	0	
1A 10A 2A 1		775-2108-003	X-REF	0	
1A 10A 2A 1 FIG 19		779-2621-001	X-REF	0	
1A 10A 2A 1 FIG 21		778-3766-002	X-REF	0	
1A 10A 2A 1 FIG 23		775-2143-001	X-REF	0	
1A 10A 2A 1 FIG 24		779-2612-001	X-REF	0	
1A 10A 2A 1 FIG 25		791-1879-001	X-REF	0	
1A 10A 2A 2		778-3455-002	X-REF	0	
1A 10A 2A 2 FIG 9		778-3405-001	X-REF	0	
1A 10A 2A 2 FIG 10		775-2275-001	X-REF	0	
1A 10A 2A 2 FIG 11		778-3443-001	X-REF	0	
1A 10A 2A 2 FIG 12		778-3451-001	X-REF	0	
1A 10A 2A 2 FIG 13		775-2098-001	X-REF	0	
1A 10A 2A 2 FIG 14		775-2137-001	X-REF	0	
1A 10A 2A 2 FIG 15		775-2140-001	X-REF	0	
1A 10A 3		792-6305-101	X-REF	0	
1A 10A 3A 1		779-3261-010	X-REF	0	
1A 10A 3A 1A 1		778-1125-001	X-REF	0	
1A 10A 3A 1A 4		775-3352-001	X-REF	0	
1A 10A 3A 1A 5		778-1122-010	X-REF	0	
1A 10A 3A 1A 7		778-1126-001	X-REF	0	
1A 10A 3A 1A 8		777-3268-001	X-REF	0	
1A 10A 3A 1A 9		778-1127-001	X-REF	0	
1A 10A 3A 1TB1		777-2878-010	X-REF	0	
1A 11		607-4564-001	X-REF	0	
1A 7A 1	1	13499 784-6100-001	PA2ZF	0	
1A 7A 3		784-6001-003	X-REF	0	
1A 7A 3A 39		619-1227-001	X-REF	0	
1A 7A 3A 40		619-2165-000	X-REF	0	
1A 9A 1	1	13499 787-6542-004	PA2ZF	0	
1A 9A 1A 1		791-1964-001	X-REF	0	
1A 9A 3		13499 787-6344-102	X-ZZF	0	
1A 9A 3A 1		789-2325-002	X-REF	0	
1A 9A 3A 1A 1		789-2323-001	X-REF	0	
1A 9A 4		13499 522-4841-103	X-ZZF	0	
1A 9A 4A 1		778-2735-001	X-REF	0	
1A 9A 4A 1A 1		778-2759-001	X-REF	0	
1A 9A 4A 2		13499 778-2736-001	X-ZZF	0	
1A 9A 4A 2A 2		778-2760-001	X-REF	0	
1A 9A 5	1	13499 522-4781-101	X-ZZF	0	
1A 9A 5A 1		777-4152-002	X-REF	0	
1A 9A 5A 1 P 1		777-4481-001	X-REF	0	
1A 9A 5A 2		777-4158-001	X-REF	0	
1A 9A 6		13499 772-5296-102	X-ZZF	0	
1A 9A 6A 3		791-2957-001	X-REF	0	
1A 9A 6A 3 F 1		791-2907-003	X-REF	0	
1A 9A 6A 3 F 2		791-2907-003	X-REF	0	
1A 9A 6A 3 F 3		791-2907-003	X-REF	0	
1ZZM79-2621-001 FIG 19 14		13499 546-6798-002	XB4ZZ	1	
1ZZ522-4781-101		13499 522-4781-101	XB444	1	
1ZZ522-4781-101 A 3		13499 778-2712-002	PB4DD	1	
1ZZ522-4781-101 A 5		13499 778-2766-001	PB4DD	1	
1ZZ522-4781-101 A 6		13499 778-2660-002	PB4DD	1	
1ZZ522-4781-101 A 7		13499 778-2711-001	PB4DD	1	
1ZZ522-4781-101 A 8		13499 778-2767-001	PB4DD	1	
1ZZ522-4781-101 A 12		13499 778-2639-001	PB4DD	1	
1ZZ522-4781-101 M 1		13499 458-0964-000	XB4ZZ	1	
1ZZ522-4841-103		13499 522-4841-103	XB444	1	
1ZZ522-4841-103 A 1		13499 778-2735-001	XB4ZZ	1	
1ZZ522-4841-103 A 3		13499 778-2729-001	PB4DD	1	
1ZZ522-4841-103 A 4		13499 778-2730-001	PB4DD	1	
1ZZ522-4841-103 A 5		13499 778-2718-001	PB4DD	1	
1ZZ522-4841-103 A 6		13499 778-2733-001	PB4DD	1	
1ZZ522-4841-103 A 7		13499 778-2734-001	PB4DD	1	
1ZZ522-4841-103 A 8		13499 778-2719-001	PB4DD	1	
1ZZ522-4841-103 A 9		13499 778-2709-001	PA4DD	1	
1ZZ522-4841-103 M 1		13499 458-0964-000	XB4ZZ	1	
[1ZZ522-4873-007]		13499 522-4873-007	XB444	1	
1ZZ522-4873-007 A 3		13499 775-0839-001	PB4DD	1	
1ZZ522-4873-007 A 4	1	13499 775-0849-001	PB4DD	1	
1ZZ522-4873-007 A 5		13499 793-9416-001	PB4DD	1	
1ZZ522-4873-007 A 6		13499 778-2881-001	PA4DD	1	
1ZZ522-4873-007 A 7		13499 793-8171-001	PB4DD	1	
1ZZ522-4873-007 A 8		13499 778-2883-001	PA4DD	1	
1ZZ522-4873-007 A 9		13499 775-0848-003	PB4DD	1	
1ZZ522-4873-007 A 10		13499 778-2882-001	PA4DD	1	
1ZZ522-4873-007 A 11	1	13499 775-0846-003	PB4DD	1	

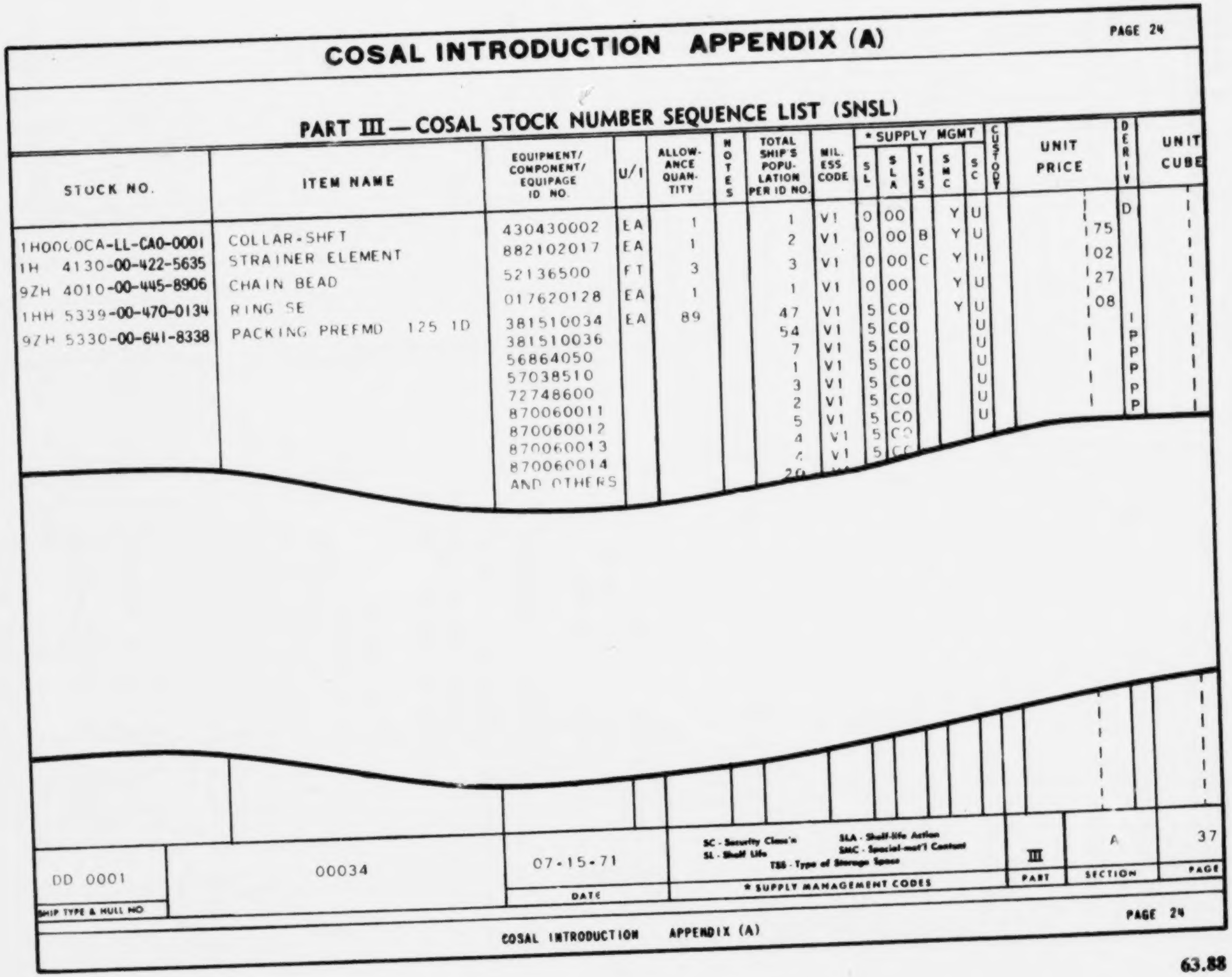
NOTE:
X-REF – The abbreviation X-REF appearing in this APL under the column headed SMR is intended to provide a Cross Reference from the Reference Designator at this point to an assembly breakdown located elsewhere in the APL. This method has been employed when redundant usage of an assembly part number in the equipment would require an assembly breakdown for each appearance. The assembly breakdown appears one time only, in sequence, further in the APL under the part number indicated.

	AN/USC-30, DATA COMMUNICATIONS SYSTEM	58582640	12-1-75	1
	NOMENCLATURE	IDENTIFICATION NO.	DATE	PAGE

63.86

Figure 5-5.—Circuit Symbol Number Lists.





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COSAL INTRODUCTION APPENDIX (A)

PART III—COSAL STOCK NUMBER SEQUENCE LIST (SNSL)

STOCK NO.	ITEM NAME	EQUIPMENT/ COMPONENT/ EQUIPAGE ID NO.	U/I	ALLOW-ANCE QUAN-TITY	NOTES	TOTAL SHIP'S POPU-LATION PER ID NO.	MIL. ESS CODE	* SUPPLY MGMT SL	SLA	TSS	SMC	SC	CUSTODY	UNIT PRICE	DERIV	UNIT CUBE
1HOOCOCA-LL-CAO-0001	COLLAR-SHFT	430430002	EA	1		1	V1	0	00		Y	U			D	
1H 4130-00-422-5635	STRAINER ELEMENT	882102017	EA	1		2	V1	0	00	B	Y	U		75		
9ZH 4010-00-445-8906	CHAIN BEAD	52136500	FT	3		3	V1	0	00	C	Y	U		02		
1HH 5339-00-470-0134	RING SE	017620128	EA	1		1	V1	0	00		Y	U		27		
9ZH 5330-00-641-8338	PACKING PREFMD 125 ID	381510034	EA	89		47	V1	5	CO		Y	U		08	I	
		381510036				54	V1	5	CO			U			P	
		56864050				7	V1	5	CO			U			P	
		57038510				1	V1	5	CO			U			P	
		72748600				3	V1	5	CO			U			P	
		870060011				2	V1	5	CO			U			P	
		870060012				5	V1	5	CO			U				
		870060013				4	V1	5	CO							
		870060014				4	V1	5	CC							
		AND OTHERS				20										

SHIP TYPE & HULL NO		DATE	* SUPPLY MANAGEMENT CODES	PART	SECTION	PAGE
DD 0001	00034	07-15-71	SC - Security Class'n SL - Shelf Life SLA - Shelf-life Action SMC - Special-mat'l Content TSS - Type of Storage Space	III	A	37

COSAL INTRODUCTION APPENDIX (A)

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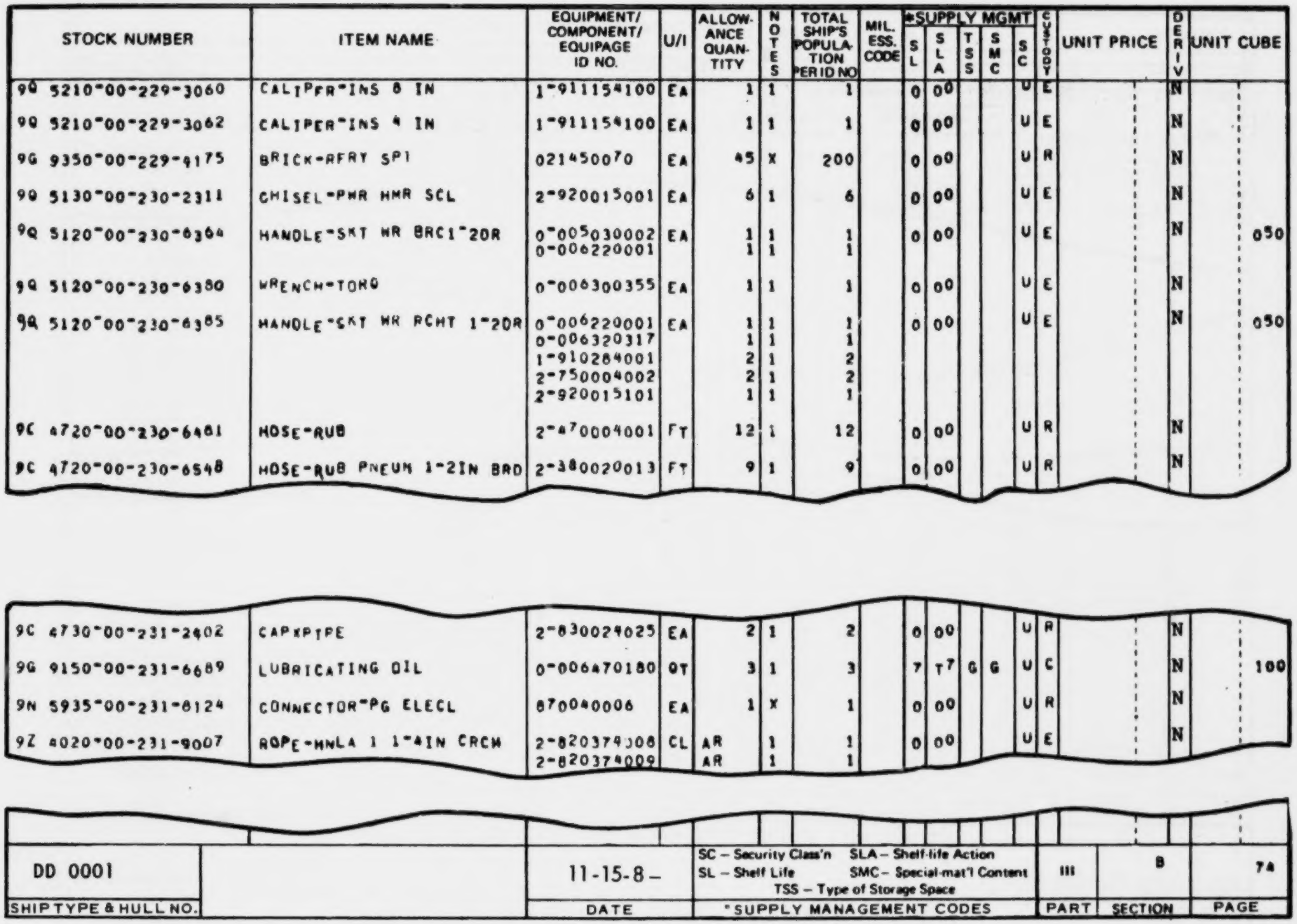
63.88

Figure 5-7.—COSAL Stock Number Sequence List (SNSL).



STOCK NUMBER	ITEM NAME	EQUIPMENT/ COMPONENT/ EQUIPAGE ID NO.	U/I	ALLOWANCE QUANTITY	NOTES	TOTAL SHIP'S POPULATION PER ID NO	MIL. ESS. CODE	*SUPPLY MGMT					CUSTODY	UNIT PRICE	DERIV	UNIT CUBE
								SL	SLA	TSS	SMC	SC				
9Q 5210-00-229-3060	CALIPER-INS 8 IN	1-911154100	EA	1	1	1		0	00			U	E		N	
9Q 5210-00-229-3062	CALIPER-INS 4 IN	1-911154100	EA	1	1	1		0	00			U	E		N	
9G 9350-00-229-9175	BRICK-RFRY SPI	021450070	EA	45	X	200		0	00			U	R		N	
9Q 5130-00-230-2311	CHISEL-PWR HMR SCL	2-920015001	EA	6	1	6		0	00			U	E		N	
9Q 5120-00-230-6364	HANDLE-SKT WR BRC1-2DR	0-005030002 0-006220001	EA	1 1	1 1	1 1		0	00			U	E		N	050
9Q 5120-00-230-6380	WRENCH-TORQ	0-006300355	EA	1	1	1		0	00			U	E		N	
9Q 5120-00-230-6385	HANDLE-SKT WR RCHT 1-2DR	0-006220001 0-006320317 1-910284001 2-750004002 2-920015101	EA	1 1 2 2 1	1 1 1 1 1	1 1 2 2 1		0	00			U	E		N	050
9C 4720-00-230-6481	HOSE-RUB	2-470004001	FT	12	1	12		0	00			U	R		N	
9C 4720-00-230-6548	HOSE-RUB PNEUM 1-2IN BRD	2-380020013	FT	9	1	9		0	00			U	R		N	
9C 4730-00-231-2402	CAPXPIPE	2-830024025	EA	2	1	2		0	00			U	R		N	
9G 9150-00-231-6689	LUBRICATING OIL	0-006470180	QT	3	1	3		7	T7	G	G	U	C		N	100
9N 5935-00-231-8124	CONNECTOR-PG ELECL	870040006	EA	1	X	1		0	00			U	R		N	
9Z 4020-00-231-9007	ROPE-MNLA 1 1-4IN CRCM	2-820374008 2-820374009	CL	AR AR	1 1	1 1		0	00			U	E		N	

DD 0001		11-15-8-	SC – Security Class'n SLA – Shelf-life Action SL – Shelf Life SMC – Special-mat'l Content TSS – Type of Storage Space	III	B	74
SHIP TYPE & HULL NO.		DATE	*SUPPLY MANAGEMENT CODES	PART	SECTION	PAGE

123.191.2

Figure 5-8.—Part III, Section B (SNSL) of Operating Space Items.

Part III, Section B

This section contains the stock number sequence list (SNSL) of operating space items arranged in ascending NIIN order. (See figure 5-8.)

Part III, Sections CF, CR, Cross-Reference, D, and E

- CF—This section contains an SNSL of maintenance assistance modules that might appear in part III, section A, as a storeroom item if usage warrants backup support. The items are arranged in ascending NIIN order.

- CR—This section contains an SNSL of ready-service spares and is arranged in ascending NIIN order. However, the entire material stock number (NSN) is shown including the cognizance symbol.

- Cross-reference—This cross-reference list has all the stock number updates. It is arranged in old number sequence and is tailored to the appropriate type of ship.

- D—This section is arranged in alternate number order; it is also tailored for the appropriate ship type and contains alternate number data (alternate number cross-referenced to stock number). Primary and secondary alternate numbers are cross-referenced in this section.

- E—This is the general use consumables list (GUCL); it contains consumables and non-equipment-related items and provides for initial outfitting of a ship's operating spaces and storerooms. It is usually published for new construction, reactivation, or major conversion ships.

For a thorough understanding of the COSAL, refer to NAVSUP P-485, *Afloat Supply Procedures*, or *Storekeeper 3 & 2*, chapter 5. As you become familiar with the COSAL, it will be easier to use.

Changes to the COSAL

When new equipment is installed aboard ship or when changes are made to equipment already on board, your ship should receive new APLs to replace obsolete lists. Make sure that new equipment or alterations to existing equipment are supported by a new APL in the COSAL and that the supply department either has the required repair parts on board in its storerooms or on order. The importance of doing this cannot be overstressed—very few things will cause as much grief for both the weapons officer and the supply officer as to discover suddenly in the middle of a deployment that there are no repair parts on board for newly installed equipment. You can prevent this type of embarrassment by ensuring that the supply department is aware that new APLs are required for the COSAL. Too often alterations are performed on existing equipment that requires new repair parts support. Make sure such alterations are brought to the supply officer's attention so that appropriate action can be taken.

Normally, the supply officer submits the appropriate documentation. However, you will be in a better position to know if your equipment is COSAL supported, and the supply officer will probably need to confer with you or your personnel to come up with complete and accurate technical data of the equipment.

NAVSUP Form 1220-2 is the prescribed document for requesting either item additions or deletions in your allowance lists. (See figure 5-9.) Form 1220-2 should be prepared by following the instructions contained on its reverse side.

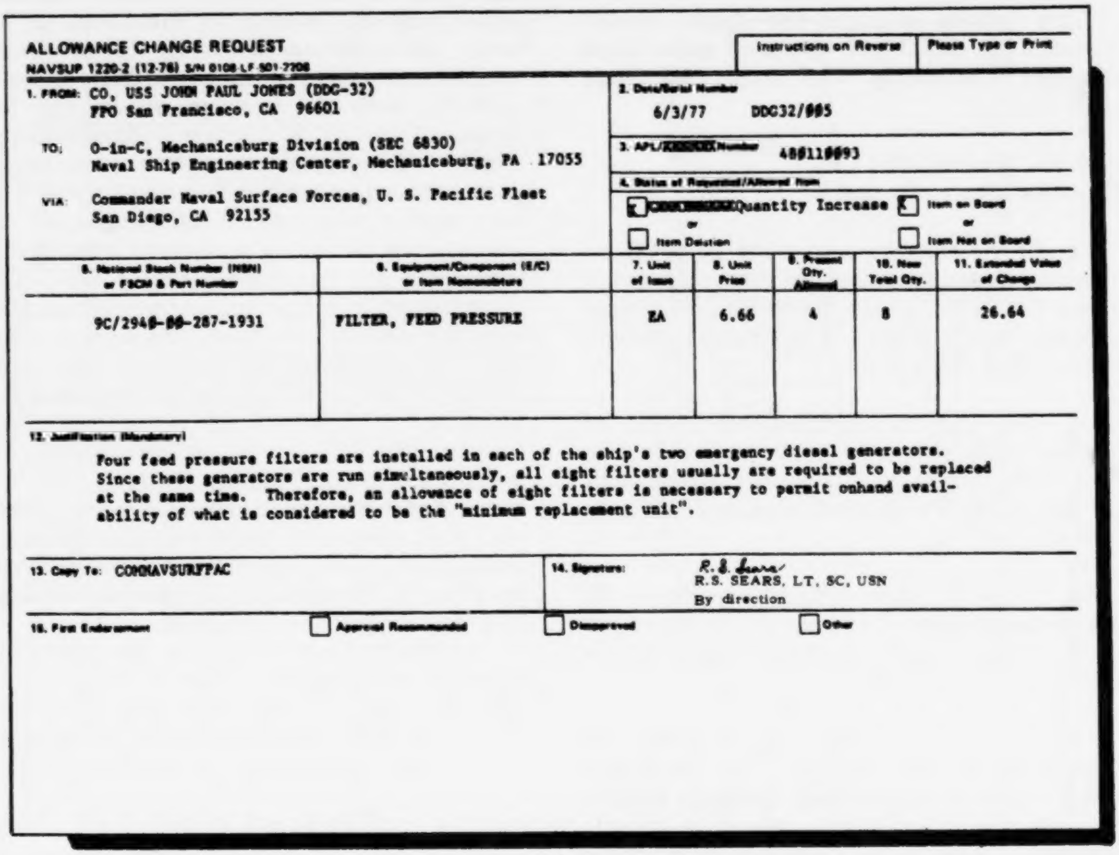
NUCLEAR WEAPONS COSAL

The format of the nuclear weapons COSAL is identical to that in the HMEO&E COSAL with the following exceptions:

1. Part II does not include CSNLs.
2. Part III does not include sections C, D, E, and F.
3. Part III, section B, includes operating space items and general-use consumables. (General-use consumables are included in part III, section B, to ensure the support of nuclear weapons equipment and spaces, even though such items may be common items used to support other shipboard equipment and spaces.)

NAVSUP PUBLICATIONS

Since the submission of a requisition for supplies sets in motion a long chain of events involving movement of materials, maintenance of stock records, and procurement actions, accurate data must be supplied by the requisitioner to ensure prompt fulfillment of a requisition.



ALLOWANCE CHANGE REQUEST
NAVSUP 1220-2 (12-76) S/N 0108-LF-501-7208

Instructions on Reverse | Please Type or Print

1. FROM: CO, USS JOHN PAUL JONES (DDG-32)
FPO San Francisco, CA 96601

TO: O-in-C, Mechanicsburg Division (SEC 6830)
Naval Ship Engineering Center, Mechanicsburg, PA 17055

VIA: Commander Naval Surface Forces, U. S. Pacific Fleet
San Diego, CA 92155

2. Date/Serial Number: 6/3/77 DDG32/005

3. APL/[illegible] Number: 480110093

4. Status of Requested/Allowed Item
☒ [illegible] Quantity Increase ☒ Item on Board
or or
☐ Item Deletion ☐ Item Not on Board

5. National Stock Number (NSN) or FSCM & Part Number	6. Equipment/Component (E/C) or Item Nomenclature	7. Unit of Issue	8. Unit Price	9. Present Qty. Allowed	10. New Total Qty.	11. Extended Value of Change
9C/2940-00-287-1931	FILTER, FEED PRESSURE	EA	6.66	4	8	26.64

12. Justification (Mandatory)
Four feed pressure filters are installed in each of the ship's two emergency diesel generators. Since these generators are run simultaneously, all eight filters usually are required to be replaced at the same time. Therefore, an allowance of eight filters is necessary to permit onhand availability of what is considered to be the "minimum replacement unit".

13. Copy To: COMNAVSURFPAC

14. Signature: R. S. Sears
R.S. SEARS, LT, SC, USN
By direction

15. First Endorsement ☐ Approval Recommended ☐ Disapproved ☐ Other

123.193.1

Figure 5-9.—NAVSUP 1220-2 (Allowance Change Request).

Management List-Navy (ML-N)

The ML-N and several related publications are designed to provide accurate management data to the end users of materials. The format and use of these publications are described in the introduction to the Navy Management Data List and related publications. These publications are used primarily by the supply department in communicating to its sources of supply. Because you will have an occasional need for information contained in them, a short description of them follows.

The ML-N is the basic publication relating to NSN management data. This list is published in NIIN sequence and includes only items for which Navy interest has been recorded. Ammunition items are included, but the *Catalog of Navy Ammunition Stock*, NAVSEA OD 12067/NAVAIR 11-1-116, is still essential for ordering and reporting ammunition. For further information concerning the ML-N, refer to NAVSUP P-4000, *Introduction to Federal Supply Catalogs and Related Publications.*

Master Cross-Reference List (MCRL)

The MCRL that is published on microfiche provides cross-reference information from reference numbers to NSNs (Part I), and from NSN to reference numbers (Part II), to assist in identifying items in the supply system.

The MCRL is a consolidated publication. It includes items of supply that are used by all services; therefore, many NSNs will be identified in the MCRL that are not listed in the ML-N.

Master Repairable Item List (MRIL)

The MRIL is a catalog of Navy-managed repairable items. The primary purpose of the MRIL is to provide fleet activities the data required for disposition of not-ready-for-issue (NRFI) repairables, including repair level data, shipping data, or, when applicable, local disposal direction. The MRIL is used with other applicable instructions when retrograde material is shipped, such as NAVSUP P-484, *Supply Afloat Packaging Procedures*, P-485 *Afloat Supply Procedures*, and so forth.

AFLOAT SHOPPING GUIDE (ASG)

The ASG is designed to assist fleet personnel in identifying to an NSN those items of supply not normally related to a part or reference number. The ASG also provides assistance in determining substitutions in the general hardware area through the use of illustrations, specifications, and narrative descriptions from which data the applicable NSNs can be determined, Sections of the ASG (seven sections) are republished when a volume of changes has accumulated.

NAVSUP P-2002

The *Navy Stock List of Publications and Forms* (NAVSUP P-2002), commonly referred to as the "I Cog Catalog," is published on microfiche and consists of three sections as follows:

Section I —Alphabetic/Numeric Listing of Form Numbers, Publication and Hull Numbers, Electronic Model Numbers, and Standard Subject Identification Code for Cog 1I Forms

Section II —Alphabetic Listing of Publication and Forms by Title/Nomenclature

Section III—Numeric Listing of Publications and Forms by Stock Number followed by NAVAIRSYSCOM Technical Directives (by type and directive number)

Publications and forms are sequenced together.

Microfiche editions are issued quarterly; each edition reflects all current Cog 1I Publications and Forms. Section I and section III reflect information such as canceled, no superseding item, superseded by, and replaced by.

The *Introduction to the Navy Stock List of Publications and Forms* provides detailed information about the columnar arrangement of the stock list. Additionally, it provides the instructions needed to requisition publications and forms.

OTHER SOURCES OF IDENTIFICATION DATA

Suppose you do not have a stock number for an item and cannot locate it in the allowance lists. Your chief sources of information for identifying it are other identification data relating to the item itself and identification publications in which available data are recorded and used.

If you can find other identification data, such as reference numbers for the item, your supply department may be able to locate the correct NSN. A reference number may be a part, type, catalog, or drawing number, or a specification or nomenclature designation that has been applied to an item by the manufacturer, contractor, or governmental agency. One of the most important sources of identification is the information on nameplates. This may include the manufacturer's name, make or model number, size, voltage, and the like. Identification publications, such as manufacturer's technical manuals in your own department, may also help you in identifying an item.

If an item of ordnance material you want to identify does not appear in the COSAL and you cannot otherwise find its federal stock number, the ordnance identification data (sometimes referred to as ordnance numbers) described below are of particular importance in identifying it. They should be used on all requests for material if a stock number is not available.

A mark number (Mk) identifies the particular model of a certain type of ordnance equipment.

A modification number (Mod) indicates a modification of the basic mark number. Modifications are numbered serially beginning with zero for each separate mark.

An identifying number is the number assigned to the blueprint plan of an ordnance component or assembly. It may be a drawing number, a list of drawing numbers, a sketch number, or an assembly number.

A piece number is a subdivision of the drawing number and identifies by a serial designation every item appearing on a given drawing.

A revision letter is often used to identify a particular revision of a drawing or list of drawings used in the manufacture of a part.

Item designators are used to identify nuclear ordnance end items. They are similar to mark and modification numbers except that a letter prefix denotes the end item (for example, B for bomb, T for tester, and H for handling equipment) and a letter suffix denotes the modification (A for modification 1, B for modification 2, and so forth). Thus, a tester, mark 3000, modification 1 is identified as T3000A. Item designators are used extensively in nuclear ordnance to simplify communications, to facilitate certain stockpile and modernization reports, and to readily identify required specially designed equipment.

SUPPLY OVERHAUL ASSISTANCE PROGRAM (SOAP)

The purpose of the SOAP is to see that each ship actually has the equipments for its mission and the repair parts it should have to support those equipments.

At least 6 months before your ship arrives at a shipyard for a supply overhaul, supply department personnel and technical personnel from your department must validate the components actually on board against those listed on current allowance lists. Be sure that the nameplate data on the equipment actually aboard are checked against the equipment listed in the allowance lists. See that personnel working with specific equipment participate in the preparation for supply overhauls as well as in planning for procurement. The accuracy of the COSAL your ship will eventually get as a result of the overhaul depends on the accuracy of identifications made during the validation. There is no single evolution that bears so directly on your shipboard supply support. If you realize that a failure to validate properly may result in no onboard supply support for the overlooked equipment, you should have no difficulty in making available well-qualified and highly-motivated personnel.

PROCUREMENT AND ISSUE

The most important job of the supply department is to provide the ship with the right material, on time, so that the material readiness of the ship may be maintained at an optimum level. To do this, the supply department maintains large stocks of repair parts and consumables in its storerooms. The procurement, inventory maintenance, and expenditure of repair parts is no simple process, for just as the Navy's weapons systems tend to become more and more sophisticated and complex, so do the problems of support for repair parts for these weapons systems. To the line officer, it often seems that the Navy's supply system is bogged down in an endless stream of paper work, resulting in frustrating delays in obtaining repair parts and other material. This paper work, however, is necessary in maintaining proper inventory control over the millions of parts required by the Navy. It does no one any good to have a repair part on board a ship if, because of improper inventory management, it cannot be located when it is needed. The purpose of the paragraphs below is to explain the interactions between your department and supply so that you will be able to get optimum service from your supply department.

This book is written primarily for the weapons officer on a destroyer, a ship that falls into the classification of a ship "with a Supply Corps officer" and which is nonautomated (that is, where inventory control procedures are done manually). On ships with a Supply Corps officer, repair parts and most consumables are maintained in the custody of the supply officer until needed. Consumables that are too bulky to be stored in supply department storerooms are stored in spaces under the control of other department heads. In the weapons department, you will probably be responsible for the storage of such items as paint, toilet paper, and swabs, and you will designate in writing a petty officer to serve as custodian of these stores. The supply officer maintains stock record cards for these items and provides the custodian with a set of locator cards. The custodian makes receipts and issues and forwards receipt and expenditure documents to the supply department for posting to its records.

Ships smaller than destroyers are usually classified as ships "without a Supply Corps officer." On these ships a line officer is designated to serve as the supply officer. Storage plans vary from ship to ship, but generally the number of repair parts that can be maintained by the supply department on these ships is limited by a lack of storage space. That results in some repair parts being maintained by the supply department and the rest being maintained by the cognizant department head, who designates one of his or her petty officers as the repair parts petty officer. The repair parts petty officer receives technical guidance from supply department personnel.

Because supply departments are experts in storage and inventory control, it is obviously desirable for all material to be stowed in supply department spaces. In those instances when this is not feasible (bulkhead mounted spaces, bulky material, and so forth), the supply officer must be authorized in writing by the commanding officer to stow material in spaces belonging to other departments. If it is authorized to stow material in your spaces, you must maintain a copy of the commanding officer's authorization on file. You will also be required to designate in writing a custodian, and you should insist that the supply officer provide written instructions for this custodian. The major responsibility of the custodian is to report to the supply officer promptly and accurately all issues, so that replenishment action can be taken by the supply department. (See NAVSUP P-485, paragraph 6009 for details.)

Specific inventory requirements for material stowed in other than supply department spaces are spelled out in NAVSUP P-485, paragraph 6062. Most significant is the requirement for a quarterly inventory of such materials to be conducted jointly by the custodian and a supply department representative. It is advisable (though not mandatory) that a report of this inventory be made in writing to the supply officer.

ISSUES FROM SUPPLY STOREROOMS

On ships that are nonautomated (ships that do not use electronic data processing equipment), the form used to request material from the supply department is either NAVSUP Form 1250 or 1250-1. On automated ships, the form used is DD Form 1348; however, DD Form 1348 is also used in some forms by the nonautomated ships. The following list of supply forms is used by nonautomated ships.

DD Forms	Title
200	Report of Survey
1149 (9 PT)	Requisition and Invoice/Shipping Document
1348 (2/4/6 PT)	DOD Single Line Item Requisition System Document (Manual)
1348-1	DOD Single Line Item Release/Receipt Document
1348-6	Non-NSN Requisition (Manual)
1348 m	DOD Single Line Item Requisition System Document (Mechanical)[1]
2090	GPLD (Government Property Lost or Damaged) Survey Certificate

NAVSUP Forms	Title
48 (9 PT)	Order and Inspection Report
306	Controlled-Equipage Custody Record
1075	Afloat Locator/Inventory Record
1114	Stock Record Card Afloat
1176-1	Julian Date Calendar—Perpetual
1220-1	Configuration Change Report
1220-2	Allowance Change Request
1250 (5 PT)	Single Line Item Consumption Document (Manual)[2]
1250-1 (7 PT)	Single Line Item Consumption/Requisition Document (Manual)[3]
1384-2	BK2 Format (12 Pitch)
1384-3	BK2 Format (10 Pitch)

Authorized Personnel

Routine issues of repair parts and consumable items from supply department storerooms are made ONLY to persons authorized in writing by the respective department head. You may authorize persons to draw material either by sending the supply officer a list of those persons so authorized or through the use of a "credit card" system. This credit card is a locally developed form similar to the one shown in figure 5-10; these credit cards are controlled by the department head. The necessity of limiting the number of people authorized to draw material is obvious—you want to ensure that repair parts and hand tools issued from supply storerooms are used to repair equipment aboard ship, not to outfit someone's personal tool kit.

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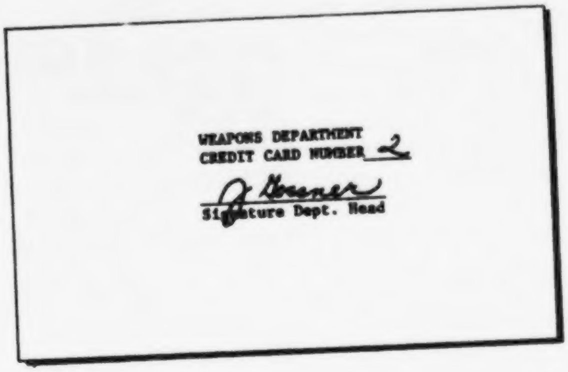
[1] Required only by ships with keypunch capability.

[2] Required only by nonautomated ships other than those in the submarine forces.

[3] Required only by ships in the submarine forces.

You will find that you can keep a tighter grip on your purse strings if you keep the number of persons with "authorized signatures" (or, alternately, those with access to your credit card) to a minimum. An additional control is that the supply department will require the person to whom material is issued from stock to sign in block 31 of the NAVSUP 1250s. You will get copies of these 1250's with your departmental

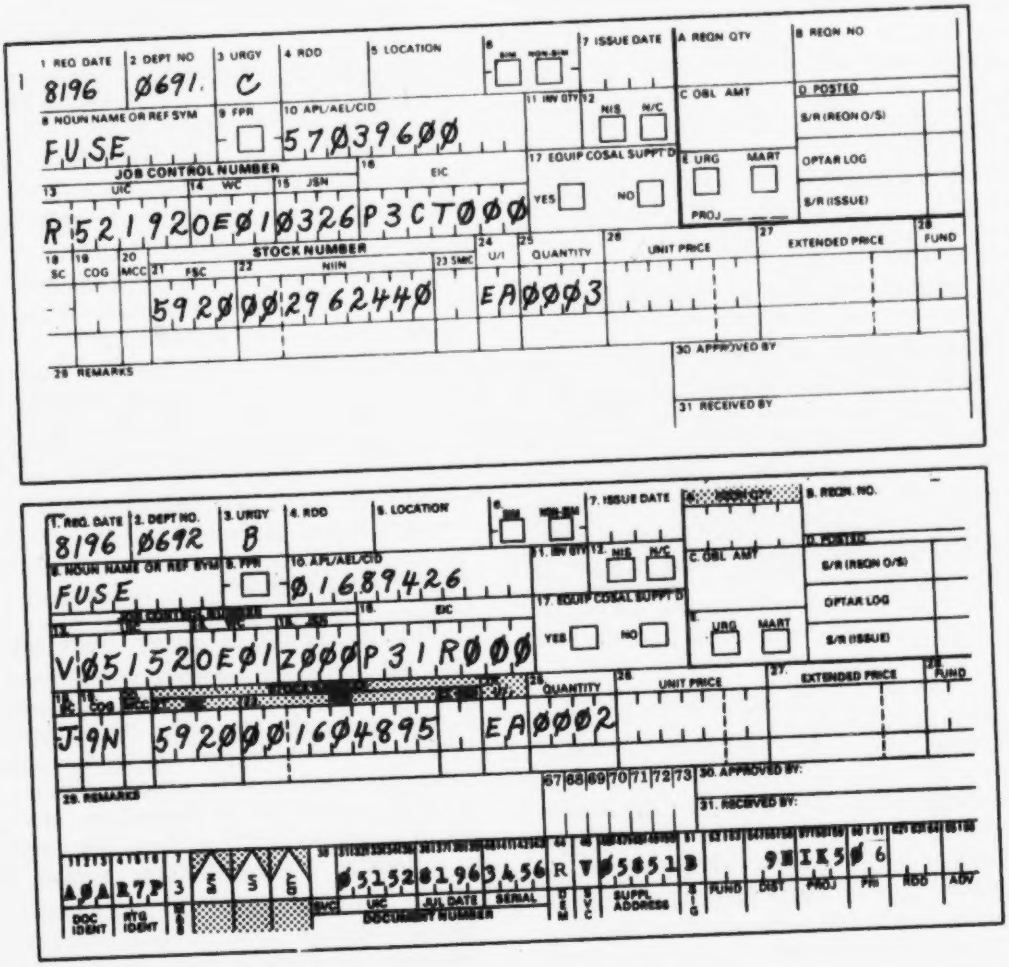


WEAPONS DEPARTMENT
CREDIT CARD NUMBER 2

Signature Dept. Head

63.53

Figure 5-10.—Credit Card.



1
1 REQ DATE: 8196
2 DEPT NO: 0691.
3 URGY: C
4 RDD
5 LOCATION
6 SIM ☐ NON-SIM ☐
7 ISSUE DATE
A REQN QTY
B REQN NO
8 NOUN NAME OR REF SYM: FUSE
9 FPR ☐
10 APL/AEL/CID: 57039600
11 INV QTY
12 NIS ☐ N/C ☐
C OBL AMT
D POSTED
S/R (REQN O/S)
JOB CONTROL NUMBER: 13 UIC: R52192 14 WC: 0E01 15 JSN: 0326
16 EIC: P3CT000
17 EQUIP COSAL SUPPT'D: YES ☐ NO ☐
E URG ☐ MART ☐
PROJ
OPTAR LOG
S/R (ISSUE)
18 SC: -
19 COG
20 MCC
STOCK NUMBER: 21 FSC: 5920 22 NIIN: 002962440
23 SMIC
24 U/I: EA
25 QUANTITY: 0003
26 UNIT PRICE
27 EXTENDED PRICE
28 FUND
29 REMARKS
30 APPROVED BY
31 RECEIVED BY

1. REQ. DATE: 8196
2. DEPT NO.: 0692
3. URGY: B
4. RDD
5. LOCATION
6. SIM ☐ NON-SIM ☐
7. ISSUE DATE
A. REQN QTY
B. REQN. NO.
8. NOUN NAME OR REF SYM: FUSE
9. FPR ☐
10. APL/AEL/CID: 01689426
11. INV QTY
12. NIS ☐ N/C ☐
C. OBL AMT
D. POSTED
S/R (REQN O/S)
JOB CONTROL NUMBER: 13. UIC: V05152 14. WC: 0E01 15. JSN: Z000
16. EIC: P31R000
17. EQUIP COSAL SUPPT'D: YES ☐ NO ☐
E. URG ☐ MART ☐
OPTAR LOG
S/R (ISSUE)
18. SC: J
19. COG: 9N
20. MCC
STOCK NUMBER: 21. FSC: 5920 22. NIIN: 001604895
24. U/I: EA
25. QUANTITY: 0002
26. UNIT PRICE
27. EXTENDED PRICE
28. FUND
67 68 69 70 71 72 73
29. REMARKS
30. APPROVED BY:
31. RECEIVED BY:
DOC IDENT: A0A
RTG IDENT: R7P
M&S: 3
DOCUMENT NUMBER: SVC UIC JUL DATE SERIAL: 05152 8196 3456
DEM: R
SVC: V
SUPPL ADDRESS: 05851
SIG: B
FUND DIST PROJ PRI: 9[illegible]IK50 6
RDD
ADV

17.84

Figure 5-11.—NAVSUP Forms 1250/1250-1.

budget report (discussed later), and you will be able to trace material that "gets lost" between supply and its intended application.

NAVSUP Forms 1250 and 1250-1

As we discussed earlier, NAVSUP Form 1250 is the most commonly used form for requisitioning items through the naval supply system. NAVSUP Form 1250-1 is used primarily by ships in the submarine forces. NAVSUP Forms 1250 and 1250-1 are the only forms that we are going to discuss in any detail, and they must be completed correctly if you are to expect full supply support.

PREPARATION OF NAVSUP FORMS 1250 AND 1250-1.—Figure 5-11 shows a NAVSUP 1250 and a 1250-1 used to request an issue. It shows all information that a customer department must include. The remainder of the form is filled in by the supply department and will not be discussed here. You will not be doing your supply department a favor by attempting to fill in these blocks. Information that your department provides is explained below:

Data Block	Data Block Caption	Explanation
1	Req. Date	Julian date on which the issue request is submitted.
2	Dept. No.	Internal control number for specific identification of the issue request, when desired.
3	Urgy	Urgency of need designator A, B, or C, as appropriate.
4	RDD	Julian date when delivery of material is required. (Entered only when the requested item is not in stock or not carried, and the priority authorized to be assigned in a requisition will not provide for timely delivery of material.)
8	Noun Name or Ref. Sym.	Noun name of requested item, except when entry of a reference symbol number for an electronic or ordnance items is required.
9	FPR	Checked when requested item is a failed part replacement.
10	APL/AEL/ CID	The allowance parts list, allowance equipage list, or other allowance list for the equipment or component in which the requested item is to be used; or (if an allowance list has not yet been developed), the component identification (CID) number, if available.
	Job Control Number	A 13-character number used to identify a maintenance action; it consists of the combined data entries in data blocks 13, 14, and 15.
13	UIC	Ship's unit identification code, prefixed by service designator code R, V, or N, as applicable.
14	WC	Work center code that identifies the work center that will use the material.
15	JSN	Job sequence number which, with the UIC and WC codes, identifies a specific or nonspecific maintenance action.
16	EIC	Equipment identification code, which identifies the system, subsystem, and/or equipment in which the requested item is to be used.
21, 22, 23	Stock	NSN, including SMIC if applicable.
24	U/I	Unit of issue.
25	Quantity	Quantity required. (Limit the quantity of each maintenance-related item requested for issue to that actually required to accomplish a specific maintenance action.)
29	Remarks	Additional information pertinent to the requested item, when required for identification or management purposes.
30	Approved by	Signature of the department head or a designated representative when appropriate.

For more information on NAVSUP Forms 1250 and 1250-1, refer to NAVSUP P-485, *Supply Procedures Afloat*.

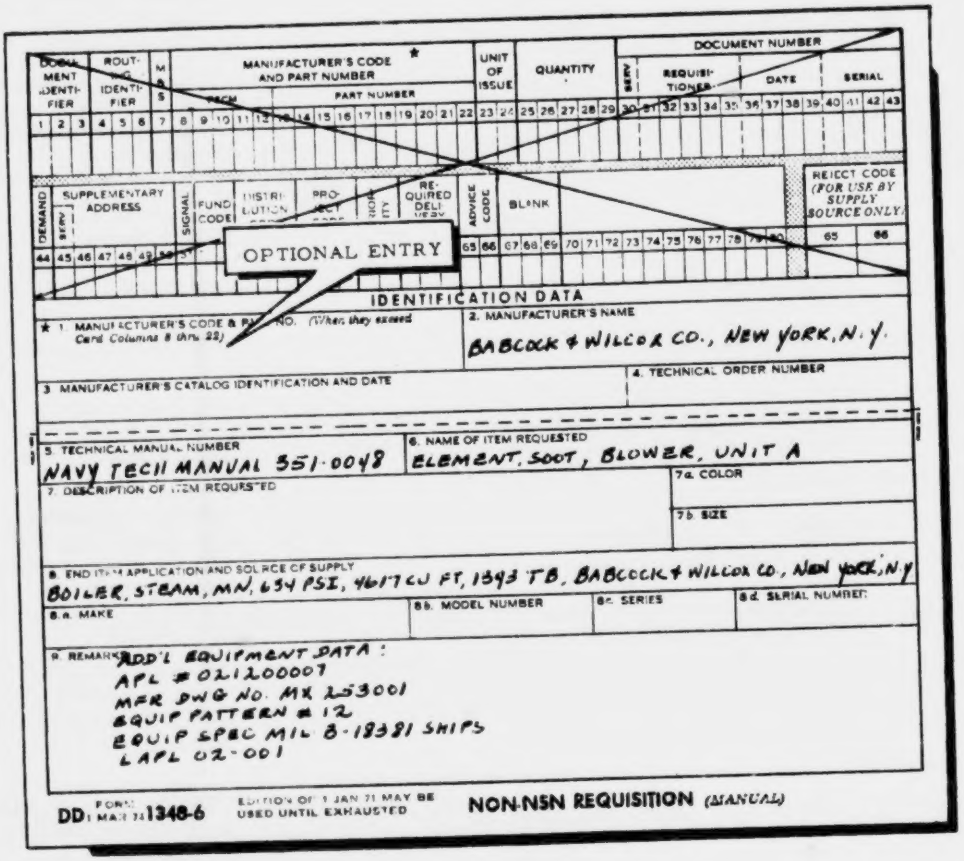
NOT-CARRIED (NC) TRANSACTIONS

Not infrequently you will have a requirement for material that is not authorized to be stocked in supply department storerooms (because it neither appears on an allowance list nor is supported by adequate usage). Not-carried material should not be ordered unless you have an immediate or definitely planned need for it. That is to say, you may not abort the Navy's financial control scheme by holding material in a weapons storeroom that is not authorized to be held in supply storerooms. If you have two different immediate or planned requirements for a not-carried item within 12 months, the supply department will be authorized to stock the material based on your usage.

Occasionally, you may feel that you are justified in requesting that a not-carried repair part be ordered for stock. When this is the case, you may request that the supply officer prepare an in-excess requisition (explained later) or that the COSAL preparation and maintenance activity be requested to provide a revision to the applicable allowance parts list to include this part in your allowance. If they concur with your justification, the allowance will be revised and the supply officer can order for stock the repair part in question.

NOT-IN-STOCK (NIS) TRANSACTIONS

So you won't think that an endless stream of paper and scientific inventory management have made the supply system infallible, we will now identify a not-in-stock transaction. An NIS transaction occurs when the supply storerooms do not have material in sufficient quantity (or maybe have none at all) to satisfy your request for an item they are authorized to carry. Such a situation does not necessarily mean that there has been a


OPTIONAL ENTRY

DOCUMENT IDENTIFIER | ROUTING IDENTIFIER | M & S | MANUFACTURER'S CODE AND PART NUMBER ★ | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER: SERV | REQUISITIONER | DATE | SERIAL

DEMAND | SUPPLEMENTARY ADDRESS | SIGNAL | FUND CODE | DISTRIBUTION | PROJECT | PRIORITY | REQUIRED DELIVERY | ADVICE CODE | BLANK | REJECT CODE (FOR USE BY SUPPLY SOURCE ONLY)

IDENTIFICATION DATA

★ 1. MANUFACTURER'S CODE & P/N NO. (When they exceed Card Columns 8 thru 22)

2. MANUFACTURER'S NAME
BABCOCK + WILCOX CO., NEW YORK, N.Y.

3. MANUFACTURER'S CATALOG IDENTIFICATION AND DATE

4. TECHNICAL ORDER NUMBER

5. TECHNICAL MANUAL NUMBER
NAVY TECH MANUAL 551-0048

6. NAME OF ITEM REQUESTED
ELEMENT, SOOT, BLOWER, UNIT A

7. DESCRIPTION OF ITEM REQUESTED

7a. COLOR

7b. SIZE

8. END ITEM APPLICATION AND SOURCE OF SUPPLY
BOILER, STEAM, MN, 654 PSI, 4617 CU FT, 1393 TB, BABCOCK + WILCOX CO., NEW YORK, N.Y

8.a. MAKE

8b. MODEL NUMBER

8c. SERIES

8d. SERIAL NUMBER

9. REMARKS
ADD'L EQUIPMENT DATA:
APL # 021200007
MFR DWG NO. MX 253001
EQUIP PATTERN # 12
EQUIP SPEC MIL B-18381 SHIPS
LAPL 02-001

DD FORM 1 MAR 74 1348-6 EDITION OF 1 JAN 71 MAY BE USED UNTIL EXHAUSTED **NON-NSN REQUISITION** *(MANUAL)*

63.89

Figure 5-12.—DD Form 1348-6.

breakdown in supply support procedures. It may be that the fire control director after 3 years of placidity has started to blow out fuses as though they were birthday candles. If the allowance for these fuses is two, say, and you have had no usage over the last 3 years, the third blowout within a short period will find no spares on board. Or maybe one of your FTs is a good buddy of the electronics storeroom SK. One night a tube, for which the storeroom allowance is one, blew. Rather than "go to all the trouble" of completing a NAVSUP 1250, the FT went to the buddy, the SK, who made the issue without the covering paper work. The SK had every good intention of posting it to the stock record card the next morning, but forgot, so a replacement for the storeroom stock was never ordered from the supply center. Two years later you have a requirement. The card shows an on-hand quantity of one, but it isn't in the storeroom. This last example is used to show you that the supply department supports you better if you and your personnel play by the rules.

USE OF DD FORM 1348-6

To this point, we have discussed the use of the NAVSUP 1250 when you have an NSN. It is completed in the same fashion when you cannot come up with an NSN, except that you should leave blocks 3 through 5 blank. In addition, you must complete DD Form 1348-6, NON-NSN Requisition, and attach it to the NAVSUP 1250-1. The DD 1348-6 is used to transmit technical data about a needed item to supply when you can find no NSN to convey the technical requirements. Therefore, if you have an NSN, you don't need to use a DD 1348-6. The more complete your technical description, the greater your chances are of getting the material speedily. (See figure 5-12.)

LEAD TIME

Lead time is an important consideration on requests for not-carried items of supply. It is the elapsed time between submission of the requisition and receipt of the material. To ensure that supplies are sent in a definite priority, the Uniform Material Movement and Issue Priority System (UMMIPS) was designed. This system will be discussed later, but, for example, the system ensures that a vital part to a radar system is sent out to the requisitioner before paintbrushes are sent out to another requisitioner.

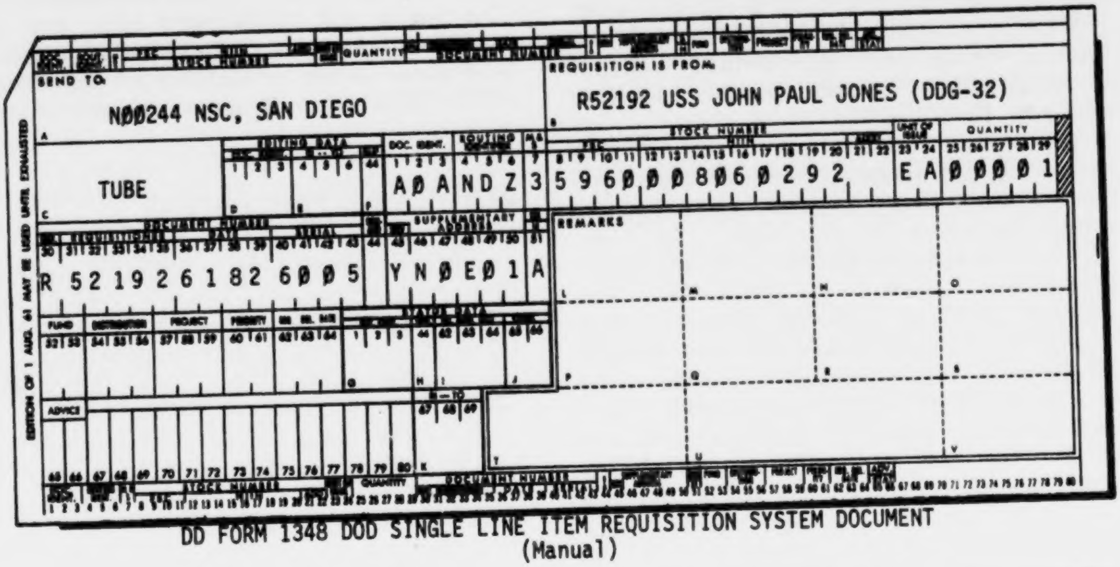
AUTOMATED PROCEDURES

The DD Form 1348 is available in two-, four-, and six-part sets. The four- and six-part forms are used for ships with an automated supply system. For a detailed description of the DD Form 1348, refer to NAVSUP P-485, *Supply Procedures Afloat*, chapter 3.

DD Form 1348 is a standard electric accounting machine card. It is used by automated ships and nonautomated ships with keypunch equipment and contains basically the same information as the standard 1348. Figure 5-13 shows DD Forms 1348 and 1348m.

UNIFORM MATERIAL MOVEMENT AND ISSUE PRIORITY SYSTEM (UMMIPS)

An integral and vital part of the Military Standard Requisitioning and Issue Procedures (MILSTRIP) is the requirement to assign priorities following standards in the UMMIPS. In the movement and issue of material, establishing a common basis is necessary to determine the relative importance of competing demands for resources of the logistics systems, such as transportation, warehousing, requisition processing, and material assets. The basis for expressing the military urgency of a requirement is the priority designator (PD), which ranges from 01 (highest) to 15 (lowest). The PD assigned to a requisition determines the time frame within which the requirement normally will be processed by the supply system. Except as prescribed in NAVSUP P-485, the PDs to be used in requisitioning material or services will be determined by the requisitioner's assigned force/activity designator (F/AD) and the applicable urgency of need designator (UND). The UND will be derived by following the criteria in NAVSUP P-485. An activity's assigned F/AD, in conjunction with the UND applicable to the requirement, determines the appropriate PDs to be assigned in requisition documents. The authorized PD (01 through 15) can be



SEND TO: N00244 NSC, SAN DIEGO

REQUISITION IS FROM: R52192 USS JOHN PAUL JONES (DDG-32)

TUBE

DOC. IDENT.: A0A

ROUTING IDENTIFIER: NDZ

M&S: 3

STOCK NUMBER: 5960008060292

UNIT OF ISSUE: EA

QUANTITY: 00001

DOCUMENT NUMBER: R52192 6182 6005

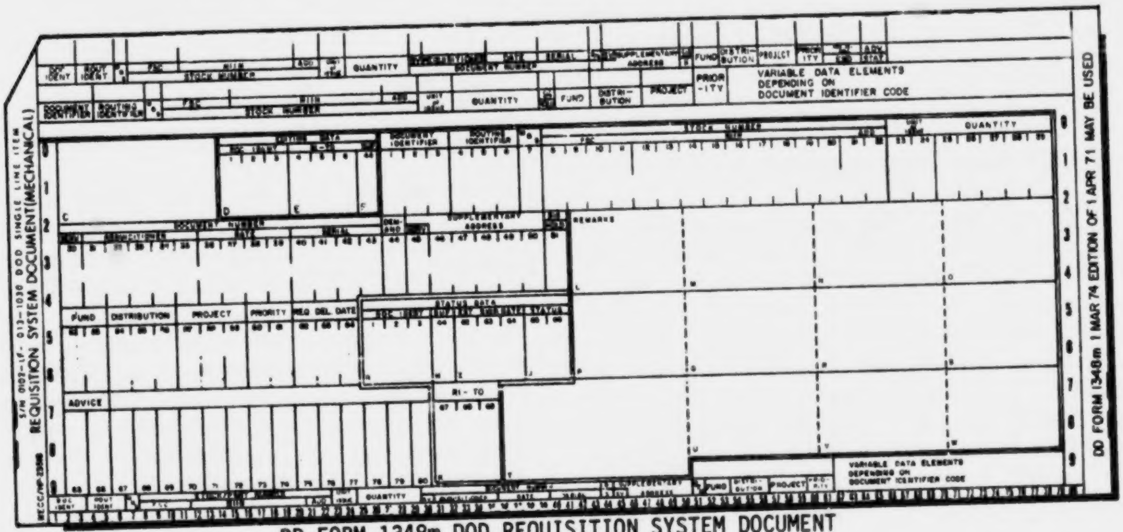
SUPPLEMENTARY ADDRESS: YN0E01

A

REMARKS

EDITION OF 1 AUG. 61 MAY BE USED UNTIL EXHAUSTED
FUND
DISTRIBUTION
PROJECT
PRIORITY
STATUS DATA
ADVICE
RI — TO

DD FORM 1348 DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT
(Manual)



QUANTITY
FUND
DISTRIBUTION
PROJECT
PRIORITY
VARIABLE DATA ELEMENTS DEPENDING ON DOCUMENT IDENTIFIER CODE
REMARKS
ADVICE
RI - TO
REQUISITION SYSTEM DOCUMENT (MECHANICAL)
DD FORM 1348m 1 MAR 74 EDITION OF 1 APR 71 MAY BE USED

DD FORM 1348m DOD REQUISITION SYSTEM DOCUMENT
(Mechanical)

123.204

Figure 5-13.—DD Forms 1348/1348m.

TABLE RELATING F/AD AND UNDs TO PRIORITY DESIGNATORS					
URGENCY OF NEED DESIGNATOR	F/AD				
	I	II	III	IV	V
	PRIORITY DESIGNATOR				
A (UNABLE TO PERFORM)	01	02	03	07	08
B (PERFORMANCE IMPAIRED)	04	05	06	09	10
C (ROUTINE)	11	12	13	14	15

Figure 5-14.—UMMIPS F/AD, UND, and PD Relationship.

derived from figure 5-14 by matching the assigned F/AD (I through V) with the applicable UND (A, B, or C). As indicated in figure 5-14, only three PDs normally are authorized for each F/AD. For detailed information on UMMIPS, refer to chapter 3, part A, section 3, NAVSUP P-485

Figure 5-14 shows the translation of UNDs to PDs, whereas figure 5-15 translates PDs to standard delivery dates throughout the world.

UMMIPS TIME STANDARDS FOR REQUISITIONED MATERIAL

Priority Designator[1,4]	CONUS Requisitioners, Canada, or POE[2]	Alaska, Hawaii, Caribbean, Central America, North Atlantic, Northern Europe[2,3]	South America, Western Mediterranean[2,3]	Africa, Eastern Mediterranean[2,3]	Far East, Southeast Asia, Australia[2,3]	Middle East (Persian Gulf, Red Sea)[2,3]
01-03	8	12	12	12	13	12
04-08	12	16	16	16	17	16
09-15	31	69	74	81	93	98

[1] When material is immediately issued by the stock point to which a requisition is submitted (or if the requisition is submitted directly to an ICP), decrease the time standards in this chart by one day for PD 01-08 requirements, and by two days for PD 09-15 requirements.

[2] These time standards represent the cumulative number of calendar days normally required for:

1. requisition submittal;
2. availability determination and storage site processing;
3. referral (see Note 1);
4. transportation hold (containerization and consolidation when required), and CONUS in-transit to CONUS requisitioner, Canada, or POE;
5. overseas shipment/delivery;
6. receipt take up by requisitioner.

[3] Time standards for PD 09-15 requirements also apply to any PD 01-08 cargo which may be diverted to surface movement. However, high priority requirements will be diverted to surface movement only when:

1. a temporary blanket authorization is granted by JCS or the cognizant CINC (CINCLANTFLT/CINCPACFLT/CINCUSNAVEUR);
2. a specific authorization is provided by the requisitioner; or
3. the characteristics of the material preclude air movement due to size, weight, or hazard classification.

[4] PD 01-03 requisitions and PD 01-08 NORS/NMCS requisitions will be processed by the supply system on a 24-hour workday, 7-day workweek basis. PD 04-08 non-NORS/PMCS requisitions and PD 09-15 requisitions will be processed on an 8-hour workday, 5-day workweek basis; however, consistent with the volume of requisitions required to be processed, the work shifts of supply activities may be adjusted, as necessary, to meet UMMIPS time frames.

63.90

Figure 5-15.—UMMIPS TIME Standard.

The standard delivery date is the latest calendar date by which material requisitioned under a particular PD can normally be expected to be received by the requisitioner. The standard delivery date is computed by adding the number of days in the applicable UMMIPS time standard (see figure 5-15) to the requisition date. If the computed delivery date will meet requirements, no delivery date will be entered in the requisition, but the RDD can be made earlier or later than the standard delivery date. (Consult NAVSUP P-485, chapter 3, for particulars.)

MILSTRIP REQUISITION

Military Standard Requisition and Issue Procedure (MILSTRIP) is a standardized system of material procurement whose heartbeat is the using of codes designed for use in electronic data processing machines.

MILSTRIP requisitioning is based upon the use of a coded, single line item document for each supply transaction. One of the following documents will be used for MILSTRIP requisitioning:

- DOD Single Line Item Requisition System Document (Manual) (DD Form 1348)
- Single Line Item Consumption/Requisition Document (Manual) (NAVSUP Form 1250-1)
- DOD Single Line Item Requisition System Document (Mechanical) (DD Form 1348m)
- Non-NSN Requisition (Manual) (DD Form 1348-6)

The procurement of ammunition will be covered in chapter 6 of *The Weapons Officer*. The supply department will complete all other requisitions.

REQUISITION STATUS AND FOLLOW-UP

It is the responsibility of the supply activity processing your requisition to keep you informed of the status of that requisition, regardless of the priority. When the supply activity has the requested material in stock and is able to process your requisition within the proper time limit, you will receive no status on the requisition unless it is high priority. However, when the supply activity does not have the requested material and either passes the requisition to another activity or backorders the material, then it is required to inform the requisitioner of these changes. Such status is known as exception status; other examples of exception status are a change in the unit of issue, a federal stock number change, substitution, or partial filling of the requisition.

On high priority requisitions, naval supply activities furnish positive advice of shipment, including date, mode of transportation, and bill of lading number; this type of status is known as shipment status. Status data is normally provided on a DD 1348, but may also be furnished by naval messages on high priority requisitions.

The supply officer maintains each status card with its requisition so that requesting departments can find out what's happening to material that they ordered. Normally, the supply department will not provide you with status on routine requisitions if it is expected that the material will be received by the date outlined in figure 5-15. On routine requisitions that are delayed beyond these dates, you will be supplied exception status along with your weekly budget report. On high priority requisitions, you will be informed of all supply/shipment status, usually as part of the 8 o'clock reports.

One of the reasons that the supply officer maintains a file of outstanding requisitions with status cards is so that appropriate follow-up action on overdue requisitions can be initiated. This file is checked periodically and MILSTRIP follow-ups are sent out on outstanding requisitions. Follow-up action is normally initiated on a DD 1348 (manual); for high priority requisitions, message follow-ups may be used, but ONLY when no other appropriate media are available. If you're concerned about the delay in receipt of material, don't sit on your hands and presume that supply has the ball. Instead, have your petty officers inquire at the supply support center about the delay.

Occasionally, you will submit a requisition under a routine UND only to find that a change in your local situation or a supply system delay has caused your anxiety to rise. If the new circumstances can justify the use of a higher UND (discussed earlier in this chapter), your supply officer can communicate your anxiety to the supply system by upgrading the priority of the initial requisition or by submitting a new requisition with the higher PD. (The lower the number of the designator, the higher the priority.) Don't trust the communications system to relay this message to your supply officer; see this officer personally. Some new paper work may be required, but if it's important enough for a priority upgrade, it's important enough to justify a personal visit.

BEARER REQUISITIONS

For certain critical items your ship needs immediately, a representative of your department or the supply department may carry a bearer requisition personally to the supplying activity ashore, walk it through each processing step, and personally pick up the material. Don't fall into the sloppy habit of putting off routine requirements secure in the knowledge that you can always get a walk through. The supply officer may put his or her foot down if you abuse the privilege of "walk throughs." Besides, your personnel and the SKs need inport time to take care of matters that really are critical in nature and which can't be handled except when in port.

IN-EXCESS REQUISITIONS

Sometimes it is necessary to request material that will bring the total quantity of a stocked item on board above that shown for the item on the allowance list. In-excess requisitions are required for all the following material:

- Equipage not on the ship's allowance list
- Equipage on the allowance list requested in greater quantities than allowed
- Nonstandard consumable supplies
- Repair parts not listed with allowed quantities on ship's allowance lists, for which a requirement can be justified

Note that the approval (by your type commander) of an in-excess requisition does not constitute a change of, or addition to, an allowance list, and additional approval is required for the replacement of in-excess articles.

NAVSUP Form 1220-2 is used to order in-excess material (allowance change request).

AMMUNITION PROCUREMENT

On most destroyers, procurement of ammunition will involve no interaction between you and the supply department. That job falls to the weapons department, alone. (See chapter 6 this text). However, should you have difficulty with the codes and forms used, the supply officer, who uses the same forms and similar coding procedures everyday, should give you assistance.

EXPENDITURES

Material is considered expended when it is issued from the supply storerooms, when it is transferred to another ship or station, and when it is surveyed. We are now going to discuss transfers, surveys, and controlled equipage.

CONTROLLED EQUIPAGE

If there is any one area which will cause a weakening of the bonds of your friendship with the supply officer, it is in the area of controlled equipage. Your concern with equipage will be operational; the supply officer's is with accountability. You will find that a little cooperation leads to a smoother relationship analogous to that previously outlined in repair parts support.

Controlled equipage consists of shipboard items selected or approved by the fleet commanders in chief for special inventory control. The items selected to be managed as controlled equipage are listed in appendix II of NAVSUP P-485 and are known as the controlled equipage item list (CEIL).

Controlled Equipage Custody Card (NAVSUP Form 306)

The supply officer is required to maintain a controlled equipage custody card (NAVSUP Form 306) for each item of controlled equipage on board. The supply officer prepares these cards in duplicate, turning over the copy to the responsible department head and maintaining the original in the safe. The allowance quantity shown on your copy of the custody card pertains to the weapons department only and may not reflect the ship's total allowance. Custody cards for items requiring a custody signature are signed by the department head on the original. Each time the balance-on-hand figure on a signature-required custody card changes, the department head is required to sign the original of the custody card again to reestablish responsibility. Custody cards for nonsignature-required equipage serve the same accountability function as do signature-required cards. Except for the department head's signature, they are maintained exactly like signature-required cards.

You should keep your file of subcustody cards under lock and key. On these duplicate copies, you should obtain a custody signature from the leading petty officer working with this equipment. When custody of an item of controlled equipage passes from one petty officer to another, be sure that the new petty officer acknowledges custody by signing your copy of the custody card. (See figure 5-16.) All transactions are recorded on NAVSUP Form 306.

NAVSUP Form 306, properly prepared and with representative entries, is illustrated in figure 5-16. The following guidelines should be followed in preparing this form.

- Custody records are numbered consecutively for each department.

- The responsible department is identified on each custody record. When quantities of the same controlled equipage item, such as typewriters or gas masks, are prorated to two or more departments, prepare separate custody records for each department, showing the numerical allowance for which the department is responsible.

- The NSN or NICN is shown when it can be determined and, when applicable, the material identification code (SMIC) is shown. Also show the cognizance symbol and appropriate material control code for mandatory turn-in repairables. When the NSN or NICN cannot be determined, enter the manufacturer's code and part number, catalog number, or other identification.

- Enter the current unit of issue and unit price, either from the ML-N or latest applicable receipt document, if available; otherwise, enter the unit of issue of a similar type of material and an estimated unit price.

- The allowance authority must be shown.

- The complete description of the item must be shown including serial numbers when required.

- The originals of NAVSUP Forms 306 and the originals of controlled equipage ADP lists, if provided with the COSAL, are maintained in any space which the supply officer considers to be most convenient and, when not in use, are kept in locked file equipment.

- Receipts and expenditures should be entered promptly. Each entry must show the date of the transaction, receipt or expenditure document number, activity received from or expended to, the quantity received or expended, and the balance. When the signature is required, each new balance must be attested by the signature of the responsible head of department.

Inventory of Controlled Equipage

All controlled equipage items must be inventoried annually during the period 15 February through 15 March and:

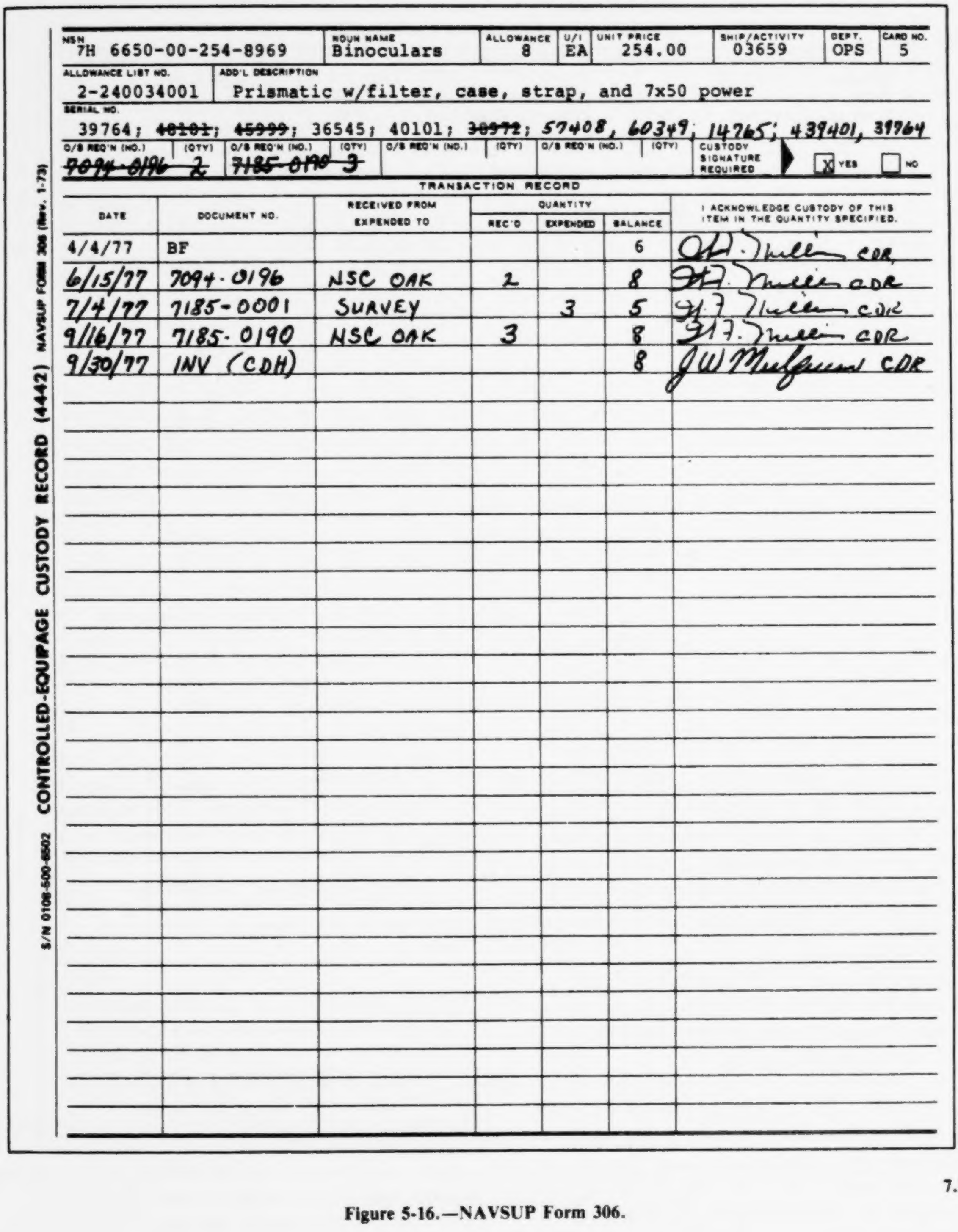
- When the ship is commissioned, inactivated, or reactivated

- Upon relief of the head of department for items in the department concerned

- Upon change of command at the discretion of the relieving command officer

Annual inventories must be completed by 15 March so that post-inventory actions can be accomplished in time to be reflected in the Equipage Control/Redistribution Source Document that may be required to be submitted as an addendum to the type commander's copy of the Budget/OPTAR Report for March following NAVSUP P-485. When a shipwide or departmental inventory of all controlled equipage has been taken during the 6-month period preceding 15 February, the annual inventory requirements for the current year are considered to be satisfied. When a departmental inventory of controlled equipage is taken incident to the relief of a department head, it is taken jointly by the relieved and relieving department heads and must be completed prior to the detachment of the relieved department head.

Prior to a physical inventory of controlled equipage, all unprocessed receipt and expenditure documents for such material must be completed and posted to applicable NAVSUP Form 306. The originals of NAVSUP Form 306 applicable to items for which serial numbers are required to be listed are reviewed to find out whether or not the serial numbers are recorded. Original custody records that do not list required serial numbers are annotated to indicate that serial numbers must be determined during the prospective inventory, and custodial department heads are advised to make the same notation, if necessary, in their duplicate custody records. At least 1 month prior to 15 February, the supply officer prepares an



S/N 0106-500-6502 **CONTROLLED-EQUIPAGE CUSTODY RECORD (4442)** NAVSUP FORM 306 (Rev. 1-73)

NSN 7H 6650-00-254-8969	NOUN NAME Binoculars	ALLOWANCE 8	U/I EA	UNIT PRICE 254.00	SHIP/ACTIVITY 03659	DEPT. OPS	CARD NO. 5

ALLOWANCE LIST NO. 2-240034001

ADD'L DESCRIPTION Prismatic w/filter, case, strap, and 7x50 power

SERIAL NO. 39764; ~~40101~~; ~~45999~~; 36545; 40101; ~~38972~~; 57408, 60349; 14765; 439401, 39764

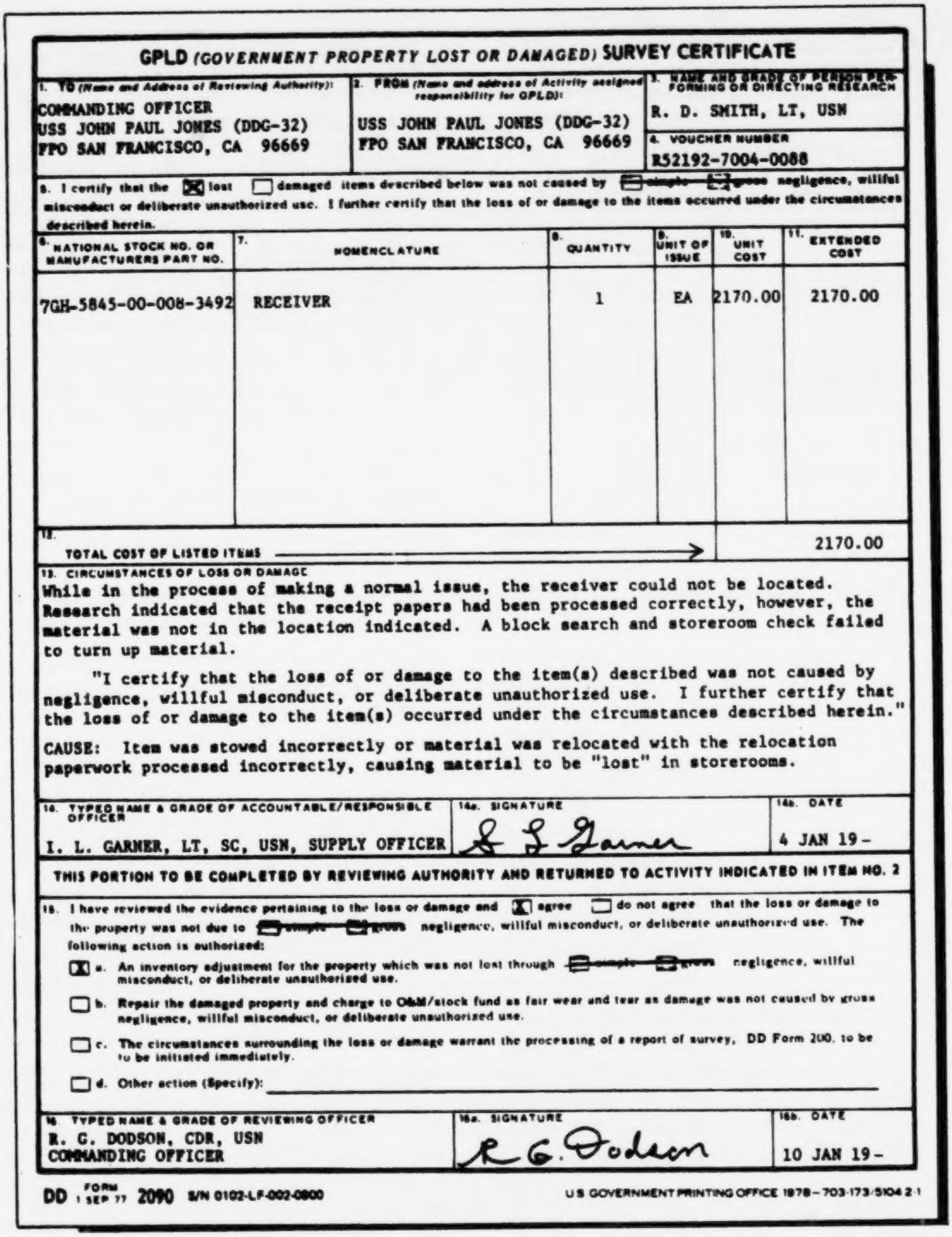
O/S REQ'N (NO.)	(QTY)	O/S REQ'N (NO.)	(QTY)	O/S REQ'N (NO.)	(QTY)	O/S REQ'N (NO.)	(QTY)	CUSTODY SIGNATURE REQUIRED
~~7094-0196~~	~~2~~	~~7185-0190~~	~~3~~					☒ YES ☐ NO

TRANSACTION RECORD

DATE	DOCUMENT NO.	RECEIVED FROM EXPENDED TO	QUANTITY			I ACKNOWLEDGE CUSTODY OF THIS ITEM IN THE QUANTITY SPECIFIED.
			REC'D	EXPENDED	BALANCE	
4/4/77	BF				6	CDR.
6/15/77	7094-0196	NSC OAK	2		8	CDR
7/4/77	7185-0001	SURVEY		3	5	CDR
9/16/77	7185-0190	NSC OAK	3		8	CDR
9/30/77	INV (CDH)				8	CDR

7.3

Figure 5-16.—NAVSUP Form 306.



GPLD *(GOVERNMENT PROPERTY LOST OR DAMAGED)* SURVEY CERTIFICATE

1. TO *(Name and Address of Reviewing Authority)*:
COMMANDING OFFICER
USS JOHN PAUL JONES (DDG-32)
FPO SAN FRANCISCO, CA 96669

2. FROM *(Name and address of Activity assigned responsibility for GPLD)*:
USS JOHN PAUL JONES (DDG-32)
FPO SAN FRANCISCO, CA 96669

3. NAME AND GRADE OF PERSON PERFORMING OR DIRECTING RESEARCH
R. D. SMITH, LT, USN

4. VOUCHER NUMBER
R52192-7004-0088

5. I certify that the ☒ lost ☐ damaged items described below was not caused by ~~☐ simple ☐ gross~~ negligence, willful misconduct or deliberate unauthorized use. I further certify that the loss of or damage to the items occurred under the circumstances described herein.

6. NATIONAL STOCK NO. OR MANUFACTURERS PART NO.	7. NOMENCLATURE	8. QUANTITY	9. UNIT OF ISSUE	10. UNIT COST	11. EXTENDED COST
7GH-5845-00-008-3492	RECEIVER	1	EA	2170.00	2170.00
12. TOTAL COST OF LISTED ITEMS →					2170.00

13. CIRCUMSTANCES OF LOSS OR DAMAGE

While in the process of making a normal issue, the receiver could not be located. Research indicated that the receipt papers had been processed correctly, however, the material was not in the location indicated. A block search and storeroom check failed to turn up material.

"I certify that the loss of or damage to the item(s) described was not caused by negligence, willful misconduct, or deliberate unauthorized use. I further certify that the loss of or damage to the item(s) occurred under the circumstances described herein."

CAUSE: Item was stowed incorrectly or material was relocated with the relocation paperwork processed incorrectly, causing material to be "lost" in storerooms.

14. TYPED NAME & GRADE OF ACCOUNTABLE/RESPONSIBLE OFFICER
I. L. GARNER, LT, SC, USN, SUPPLY OFFICER

14a. SIGNATURE
I. L. Garner

14b. DATE
4 JAN 19-

THIS PORTION TO BE COMPLETED BY REVIEWING AUTHORITY AND RETURNED TO ACTIVITY INDICATED IN ITEM NO. 2

15. I have reviewed the evidence pertaining to the loss or damage and ☒ agree ☐ do not agree that the loss or damage to the property was not due to ~~☐ simple ☐ gross~~ negligence, willful misconduct, or deliberate unauthorized use. The following action is authorized:

☒ a. An inventory adjustment for the property which was not lost through ~~☐ simple ☐ gross~~ negligence, willful misconduct, or deliberate unauthorised use.

☐ b. Repair the damaged property and charge to O&M/stock fund as fair wear and tear as damage was not caused by gross negligence, willful misconduct, or deliberate unauthorized use.

☐ c. The circumstances surrounding the loss or damage warrant the processing of a report of survey, DD Form 200, to be to be initiated immediately.

☐ d. Other action (Specify): ____________________

16. TYPED NAME & GRADE OF REVIEWING OFFICER
R. G. DODSON, CDR, USN
COMMANDING OFFICER

16a. SIGNATURE
R G. Dodson

16b. DATE
10 JAN 19-

DD FORM 1 SEP 77 2090 S/N 0102-LF-002-0800

US GOVERNMENT PRINTING OFFICE 1978—703-173/5104 2-1

123.200

Figure 5-17.—DD Form 2090.

official notice advising all department heads of procedural details to be followed in conducting their annual inventories of controlled equipage. The notice is signed by the commanding officer or by an officer with delegated authority.

Each head of department is responsible for conducting the inventory of items for which he or she has custody. The department head's file of duplicate NAVSUP Form 306 is used to conduct and record physical inventory of controlled equipage. Each item must be sighted and inspected for serviceability by the person conducting the inventory. Serial number control must be maintained on those items identified by "#" in appendix II and in NAVSUP P-485. Any differences between serial numbers on the material and those recorded in related custody records must be investigated and reconciled. The date of the inventory, the quantity inventoried, and the signature of the person conducting the inventory must be entered by pen or indelible pencil in the Inventory Record of the department head's duplicate custody records.

As the inventory progresses, or immediately after its completion, the inventory entries recorded in the duplicate custody records are transcribed to the originals maintained by the supply officer. When the inventoried quantity of any item differs from the verified custody record balance, recounts and/or investigative research are required following NAVSUP P-485.

Upon completion of a controlled equipage inventory, each department head must submit a letter report to the commanding officer, with a copy to the supply officer. When controlled equipage is inventoried incident to a change of department head, the letter report must be signed by both the relieved and relieving department heads.

Your department may end up with items of controlled equipage in excess of allowance. These excess items will be reported by your supply officer to the type commander for disposition action.

TRANSFERS

A transfer generally occurs when another ship or station requests material that your ship has on hand. All transfers must be approved by the commanding officer, supply officer, and the department head who has control of the material. Frequently, the commanding officer will delegate to department heads the authority to approve transfers, which means that you only have to concern yourself with two approvals. The paper work involved in a transfer is prepared by the supply department.

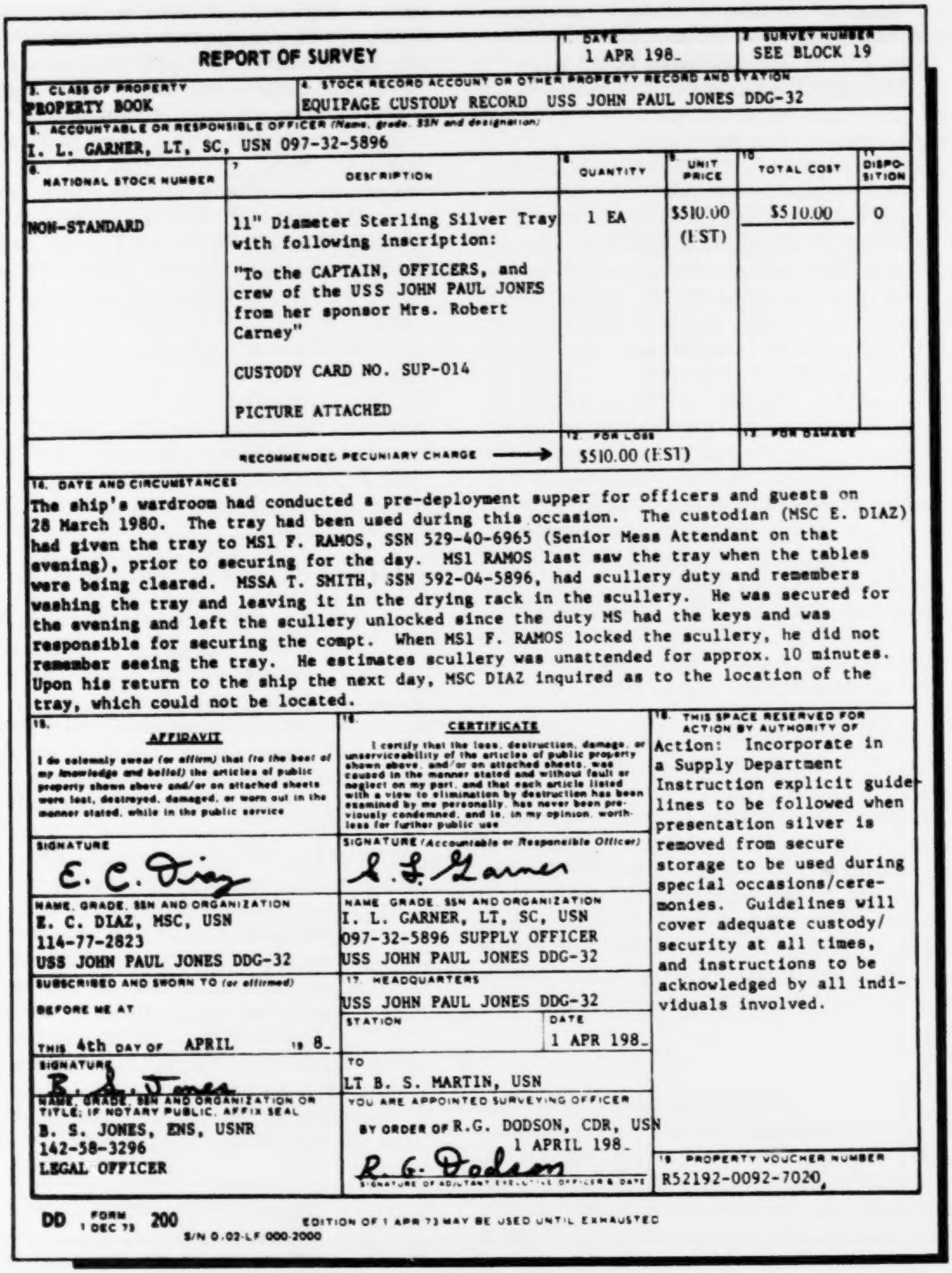
The most common type of transfer involves emergency requirements for repair parts while the ship is deployed. If another ship, which is deployed with you, requires a repair part that your ship has on board in its supply storeroom, the supply officer usually will transfer this part after consulting with you and the commanding officer, even if there is only one of these parts aboard, unless, of course, you feel that you will require this part in the immediate future. As the probability is very slight that your ship will need this same repair part before supply can procure a replacement, you should agree to the transfer of this repair part to the requesting ship, because this transfer action allows another ship to get vital equipment back into operating condition with the least cost to the Navy. Another practical reason for this policy is that there will be times when the shoe is on the other foot, and if your ship has the reputation of transferring repair parts to other ships in dire need, the chances of your urgent request for a repair part being answered are much greater.

SURVEYS

A survey is the procedure that must be followed when Navy property is lost, damaged, or destroyed. A survey must be initiated for all Navy property except incoming shipments, in which case, a Report of Discrepancy (ROD) (Standard Form 364) must be submitted. (You should consult chapter 4, NAVSUP P-485.) The completed survey form is used to determine responsibility for lost, damaged, or destroyed property and to fix the actual loss to the government. To make a true determination, the facts surrounding the loss or damage must be thoroughly researched in a timely manner. The research should not be limited to verifying statements of interested parties, but should be broad enough to ensure that the interests of the government as well as the rights of the individual(s) or Navy activities concerned are fully protected. Review of the survey information facts is required in order to prove or refute the statements of interested persons and to place the responsibility for the lost or damaged property where it belongs.

Survey Forms

The two forms which are used in connection with survey procedures are DD Form 2090 GPLD (Government Property Lost or Damaged) Survey Certificate, and DD Form 200 (Report of Survey). (See figures 5-17, 5-18, and 5-19.)



REPORT OF SUVEY

1. DATE
1 APR 198_

2. SURVEY NUMBER
SEE BLOCK 19

3. CLASS OF PROPERTY
PROPERTY BOOK

4. STOCK RECORD ACCOUNT OR OTHER PROPERTY RECORD AND STATION
EQUIPAGE CUSTODY RECORD USS JOHN PAUL JONES DDG-32

5. ACCOUNTABLE OR RESPONSIBLE OFFICER *(Name, grade, SSN and designation)*
I. L. GARNER, LT, SC, USN 097-32-5896

6. NATIONAL STOCK NUMBER	7. DESCRIPTION	8. QUANTITY	9. UNIT PRICE	10. TOTAL COST	11. DISPOSITION
NON-STANDARD	11" Diameter Sterling Silver Tray with following inscription: "To the CAPTAIN, OFFICERS, and crew of the USS JOHN PAUL JONES from her sponsor Mrs. Robert Carney" CUSTODY CARD NO. SUP-014 PICTURE ATTACHED	1 EA	$510.00 (EST)	$510.00	0
	RECOMMENDED PECUNIARY CHARGE →	12. FOR LOSS $510.00 (EST)		13. FOR DAMAGE	

14. DATE AND CIRCUMSTANCES
The ship's wardroom had conducted a pre-deployment supper for officers and guests on 28 March 1980. The tray had been used during this occasion. The custodian (MSC E. DIAZ) had given the tray to MS1 F. RAMOS, SSN 529-40-6965 (Senior Mess Attendant on that evening), prior to securing for the day. MS1 RAMOS last saw the tray when the tables were being cleared. MSSA T. SMITH, SSN 592-04-5896, had scullery duty and remembers washing the tray and leaving it in the drying rack in the scullery. He was secured for the evening and left the scullery unlocked since the duty MS had the keys and was responsible for securing the compt. When MS1 F. RAMOS locked the scullery, he did not remember seeing the tray. He estimates scullery was unattended for approx. 10 minutes. Upon his return to the ship the next day, MSC DIAZ inquired as to the location of the tray, which could not be located.

15. AFFIDAVIT

I do solemnly swear *(or affirm)* that *(to the best of my knowledge and belief)* the articles of public property shown above and/or on attached sheets were lost, destroyed, damaged, or worn out in the manner stated, while in the public service

SIGNATURE
E. C. Diaz

NAME, GRADE, SSN AND ORGANIZATION
E. C. DIAZ, MSC, USN
114-77-2823
USS JOHN PAUL JONES DDG-32

SUBSCRIBED AND SWORN TO *(or affirmed)*
BEFORE ME AT
THIS 4th DAY OF APRIL 19 8_

SIGNATURE
B. S. Jones

NAME, GRADE, SSN AND ORGANIZATION OR TITLE; IF NOTARY PUBLIC, AFFIX SEAL
B. S. JONES, ENS, USNR
142-58-3296
LEGAL OFFICER

16. CERTIFICATE

I certify that the loss, destruction, damage, or unserviceability of the articles of public property shown above, and/or on attached sheets, was caused in the manner stated and without fault or neglect on my part, and that each article listed with a view to elimination by destruction has been examined by me personally, has never been previously condemned, and is, in my opinion, worthless for further public use

SIGNATURE *(Accountable or Responsible Officer)*
I. L. Garner

NAME GRADE SSN AND ORGANIZATION
I. L. GARNER, LT, SC, USN
097-32-5896 SUPPLY OFFICER
USS JOHN PAUL JONES DDG-32

17. HEADQUARTERS
USS JOHN PAUL JONES DDG-32

STATION

DATE
1 APR 198_

TO
LT B. S. MARTIN, USN

YOU ARE APPOINTED SURVEYING OFFICER

BY ORDER OF R.G. DODSON, CDR, USN
1 APRIL 198_
R. G. Dodson
SIGNATURE OF ADJUTANT EXECUTIVE OFFICER & DATE

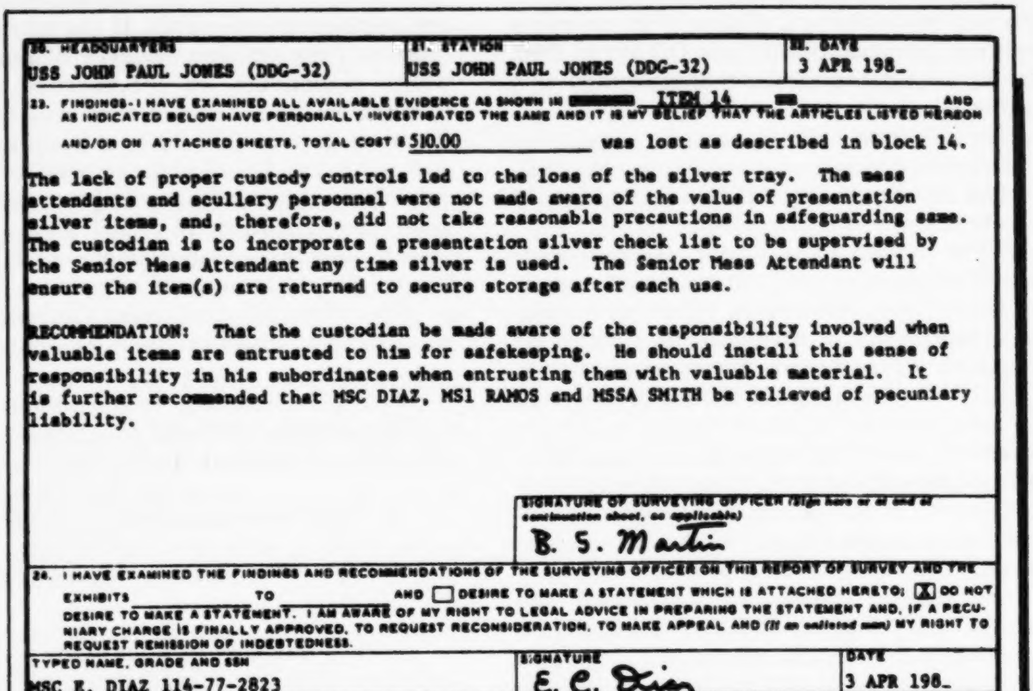
18. THIS SPACE RESERVED FOR ACTION BY AUTHORITY OF
Action: Incorporate in a Supply Department Instruction explicit guidelines to be followed when presentation silver is removed from secure storage to be used during special occasions/ceremonies. Guidelines will cover adequate custody/security at all times, and instructions to be acknowledged by all individuals involved.

19. PROPERTY VOUCHER NUMBER
R52192-0092-7020

DD FORM 1 DEC 73 200 EDITION OF 1 APR 73 MAY BE USED UNTIL EXHAUSTED
S/N 0102-LF 000-2000

123.201

Figure 5-18.—DD Form 200 (Front Page).



20. HEADQUARTERS USS JOHN PAUL JONES (DDG-32)	21. STATION USS JOHN PAUL JONES (DDG-32)	22. DATE 3 APR 198_

23. FINDINGS - I HAVE EXAMINED ALL AVAILABLE EVIDENCE AS SHOWN IN [redacted] ITEM 14 [redacted] AND AS INDICATED BELOW HAVE PERSONALLY INVESTIGATED THE SAME AND IT IS MY BELIEF THAT THE ARTICLES LISTED HEREON AND/OR ON ATTACHED SHEETS, TOTAL COST $ 510.00 was lost as described in block 14.

The lack of proper custody controls led to the loss of the silver tray. The mess attendants and scullery personnel were not made aware of the value of presentation silver items, and, therefore, did not take reasonable precautions in safeguarding same. The custodian is to incorporate a presentation silver check list to be supervised by the Senior Mess Attendant any time silver is used. The Senior Mess Attendant will ensure the item(s) are returned to secure storage after each use.

RECOMMENDATION: That the custodian be made aware of the responsibility involved when valuable items are entrusted to him for safekeeping. He should install this sense of responsibility in his subordinates when entrusting them with valuable material. It is further recommended that MSC DIAZ, MS1 RAMOS and MSSA SMITH be relieved of pecuniary liability.

SIGNATURE OF SURVEYING OFFICER *(Sign here or at end of continuation sheet, as applicable)*
B. S. Martin

24. I HAVE EXAMINED THE FINDINGS AND RECOMMENDATIONS OF THE SURVEYING OFFICER ON THIS REPORT OF SURVEY AND THE EXHIBITS ______ TO ______ AND ☐ DESIRE TO MAKE A STATEMENT WHICH IS ATTACHED HERETO; ☒ DO NOT DESIRE TO MAKE A STATEMENT. I AM AWARE OF MY RIGHT TO LEGAL ADVICE IN PREPARING THE STATEMENT AND, IF A PECUNIARY CHARGE IS FINALLY APPROVED, TO REQUEST RECONSIDERATION, TO MAKE APPEAL AND *(If an enlisted man)* MY RIGHT TO REQUEST REMISSION OF INDEBTEDNESS.

TYPED NAME, GRADE AND SSN MSC E. DIAZ 114-77-2823	SIGNATURE E. C. Diaz	DATE 3 APR 198_

25. I HAVE WITNESSED THE DESTRUCTION OF THE ARTICLES TO BE DESTROYED AND/OR RECEIVED THE ARTICLES TO BE TURNED IN TO SALVAGE

DATE	OFFICER WITNESSING DESTRUCTION, OR SALVAGE OFFICER

26. APPROVED: Any damaged property shown above and/or on attached sheets has been inspected by me, or by a disinterested officer of suitable grade and arm or service, and the disposal indicated is in the best interests of the public service.

SIGNATURE OF APPOINTING AUTHORITY
R. G. Dodson

TYPED NAME AND GRADE
R.G. DODSON, CDR,USN

HEADQUARTERS
COMMANDING OFFICER

STATION
USS JOHN PAUL JONES (DDG_32)

DATE
4 APR 198_

27. RESERVED FOR ACTION OF INSTALLATION COMMANDER *(Accountable Activity)*

28. REVIEWED BY THE FINANCE OFFICER

HEADQUARTERS

DATE

NUMBER	INITIALS

29. FOR ACTION OF REVIEWING AUTHORITY ONLY

APPROVED: R. G. Dodson
R. G. DODSON, CDR, USN

NOTE: Items 30 and 31 are provided for any additional data required by individual regulations/procedures of using components.

30.	31.

123.201.1

Figure 5-19.—DD Form 200 (Back Page).

The DD Form 2090 will be used if no personal responsibility is evident (including arms and equipment). The DD Form 200 will be used if personal responsibility is evident, if the reviewing authority does not approve the DD Form 2090, and if the commanding officer or higher authority so directs.

The DD Form 2090 will normally be prepared by the person who conducted further research.

The DD Form 200 will be initiated by the accountable/responsible person.

When circumstances warrant, such as when there is an indication of criminal action or gross negligence, the commanding officer or a designated representative may appoint a surveying officer or survey board. (Refer to chapter 5, NAVSUP P-485, for survey board procedures.)

Research action is not required when it is the opinion of the commanding officer or a designated representative that negligence is not indicated in the loss, damage, or destruction of government property, or when, for reasons known to the commanding officer, negligence, or responsibility cannot be determined and research under those conditions would constitute an unnecessary administrative burden. Research action is not usually required when an individual accepts responsibility for loss, damage, or destruction of government property. (See chapter 5, NAVSUP P-485.) At the discretion of the commanding officer or a designated representative, investigative reports required by other appropriate DOD component regulations may be used in lieu of research procedures prescribed in chapter 5, NAVSUP P-485, under the following circumstances:

- There is no death nor personal injury involved

- The total property damage does not exceed $200

- There is no possible claim against the government

Survey Procedures

Immediately upon discovery of loss, damage, or destruction of government property, the department head or division officer will determine if there is evidence of negligence, willful misconduct, or deliberate unauthorized use. When the preliminary research fails to show positive evidence of negligence, willful misconduct, or unauthorized use, the accountable or responsible officer initiates a GPLD Survey Certificate (DD 2090) for relief of the individual concerned and adjustment of records. If the results of the research show positive evidence of negligence, willful misconduct, or unauthorized use, the accountable/responsible officer will initiate a Report of Survey (DD 200), unless the amount does not exceed $500 and the responsible individual voluntarily consents to reimburse the government. (See chapter 5, NAVSUP P-485.) In the case of voluntary reimbursement, a GPLD may be used for adjustment of records.

The criteria for performing further research on unresolved discrepancies is as follows:

1. Sensitive items; for example, drugs, precious metals, when any discrepancy occurs, regardless of dollar value

2. Classified items regardless of dollar value

3. Pilferable items—when discrepancy is $500 or more

4. Any discrepancy when there is an indication or suspicion of fraud, theft, or negligence

5. Arms—ammunition—mandatory for all personal arms, whether or not pecuniary liability is admitted (refer to SECNAVINST 5500.4)

6. Repetitive losses and the dollar value of the adjustment equals or exceeds projected costs of report of investigation

7. Bulk petroleum—loss exceeding stated allowances

8. Mandatory turn-in repairables, including items that have been invoiced and shipped but not received

9. Discrepancies over $50,000 (all items)

10. When requested by the accountable officer

11. Shortage in receipts from fleet issue ships when the value of the shortage is $100 or more per UNREP

12. Missing controlled equipage, including items that have been invoiced and shipped but not received; and all unserviceable controlled equipage that is beyond economical repair except chronometers

13. Presentation silver and other valuable gifts missing or destroyed

In most of the above situations, an SK will be called upon to assist in the research.

Survey Board

A survey board may be appointed by the commanding officer for the specific purpose of conducting investigations on reports of survey. The survey board provides greater surveillance over the loss or damage investigations and facilitates processing actions. One member of the board (usually the senior member) will be designated to serve as appointing authority. Letters/orders are issued to establish the board and name the persons detailed to it. The scope and functions of the board are outlined in this course. In no event will the commanding officer or designee delegate authority to review surveys to the following individuals:

- The person on whose records the material being surveyed is carried
- The person charged with custody of the material being surveyed
- The surveying officer or members of the survey board

A survey board may consist of two or more persons. Commissioned or warrant officers are normally appointed to survey boards. It is recognized that, because of the nature of activities or types of personnel by which manned, there may not be enough officers available to appoint to the board. If such conditions exist, qualified enlisted personnel in pay grades E-8 or E-9 may be appointed to the board. Commanding officers should be extremely careful to select competent personnel to conduct investigations.

The primary purpose of the survey board is to consolidate the functions of the appointing authority and the survey officer. Its objective is to relieve commanding officers from the administrative burdens involved in the report of survey procedures. Survey boards, when directed, assist the commanding officer by furnishing advice and conducting investigations on surveys for any type of property adjustment for losses submitted to the command for action.

The following are specific functions of a survey board; however, a board is not limited to these functions:

1. Take the action of surveying officer on reports of survey when the preliminary investigation indicates this is necessary. The member of the board who has been authorized to serve as appointing authority can limit the scope of the investigation as surveying officer. This limitation may include only such investigation as would be acceptable to him or her as the appointing authority.

2. Act as a group of disinterested persons to inspect and witness the destruction or abandonment of unserviceable property.

Final action by the appointing authority on the report of survey. The board member serving as appointing authority completes the action on DD Form 200 and recommends relief from an assessment of liability.

FINANCIAL CONTROL OF SHIPBOARD SPENDING

The supply officer is responsible to the commanding officer for recording and controlling the money spent for general stores and technical materials which are chargeable to your type commander's funds. The purpose of this section is to explain the basic tenets of financial control of shipboard spending and how it relates to you as weapons officer.

Operating Budgets

After each Navy appropriation or fund passed by Congress becomes law, the amount appropriated is assigned to one or more Navy systems commands, bureaus, or offices, which have administrative control over its expenditure.

Before any Navy activity can expend money or incur obligations under an appropriation, however, the systems command, bureau, or office administering the appropriation must issue an authorization. The most common type of authorization is an operating budget.

An operating budget is an authorization made directly or indirectly to fleet commanders and other naval commands, such as your type commander, to incur obligations or to make expenditures of funds controlled by the authorizing systems command, bureau, or office.

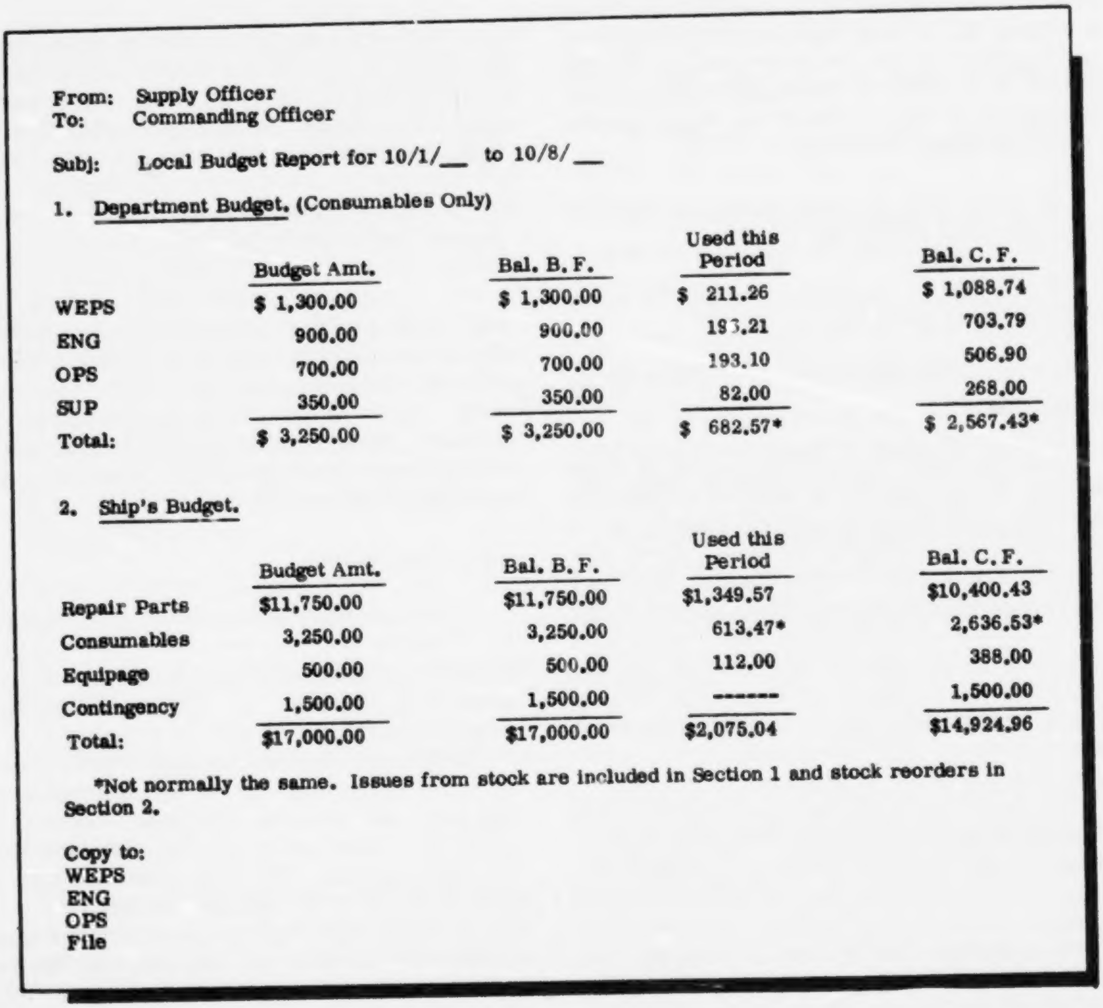
The fleet commanders in turn allot funds to type commanders.

Type commanders (and the ships of their command) use these allotments to finance (1) procurement of material from NSA (except fuel, subsistence items, ship's store resale items, clothing, and medical and dental material); (2) procurement of material and services by purchase; and (3) direct labor charges for work performed by naval shore stations.

Type commanders limit the amount your commanding officer may spend by assigning your ship an operating target (OPTAR), which cannot be exceeded without the type commander's approval. Some type commands will specify how the money should be spent (for example, X dollars for repair parts, Y dollars for consumables, Z dollars for equipage); others permit the individual ship to make this breakdown.

OPTAR Funds

The commanding officer apportions the ship's OPTAR between planned expenditures for repair parts, controlled equipage, and consumables according to past usage data provided by the supply department's financial records and also according to the expected needs of each



From: Supply Officer
To: Commanding Officer

Subj: Local Budget Report for 10/1/__ to 10/8/__

1. Department Budget. (Consumables Only)

	Budget Amt.	Bal. B. F.	Used this Period	Bal. C. F.
WEPS	$ 1,300.00	$ 1,300.00	$ 211.26	$ 1,088.74
ENG	900.00	900.00	193.21	703.79
OPS	700.00	700.00	193.10	506.90
SUP	350.00	350.00	82.00	268.00
Total:	$ 3,250.00	$ 3,250.00	$ 682.57*	$ 2,567.43*

2. Ship's Budget.

	Budget Amt.	Bal. B. F.	Used this Period	Bal. C. F.
Repair Parts	$11,750.00	$11,750.00	$1,349.57	$10,400.43
Consumables	3,250.00	3,250.00	613.47*	2,636.53*
Equipage	500.00	500.00	112.00	388.00
Contingency	1,500.00	1,500.00	------	1,500.00
Total:	$17,000.00	$17,000.00	$2,075.04	$14,924.96

*Not normally the same. Issues from stock are included in Section 1 and stock reorders in Section 2.

Copy to:
WEPS
ENG
OPS
File

63.54

Figure 5-20.—Weekly Budget Report.

department. Most commanding officers also establish a contingency fund to serve as a reserve for unexpected or emergency expenditures.

Repair parts are budgeted on a shipwide rather than departmental basis for two reasons. In the first place, repair parts bear more directly on the ship's operational readiness than do consumables and controlled equipage. The commanding officer will want to keep a finger on this vital area. Secondly, you can't predict with any accuracy when you will need repair parts. A shipwide averaging of repair parts requirements will tend to level out the peaks and valleys that characterize departmental requirements.

Expenditures for controlled equipage are tied to your list of shipwide deficiencies. Frequently, your type commander will specifically grant funds to procure all or a percentage of your deficiencies. Otherwise, decisions to procure items of controlled equipage are based on the overall importance of those items to the ship's mission rather than on the solvency of the budget of the department head who is responsible for the item. Consequently, funds for procurement of controlled equipage are budgeted on a shipwide basis.

Your departmental budget will, therefore, be concerned only with expenditures for consumable material. These expenditures will include the value of issues of consumable material from supply storerooms to your department and the value of requisitions for not-carried and not-in-stock consumables ordered by your department.

BUDGET REPORTS

Weekly, the supply officer prepares a budget report for the commanding officer, such as the one illustrated in figure 5-20. This report is divided into two parts. The first part is concerned with the departmental budgets and shows how well each department head is staying within the assigned budget. This will reflect charges for consumables issued from supply department storerooms and for requisitions for not-carried and not-in-stock consumables. The figures for your department are substantiated by the pink copies of NAVSUP 1250s covering your department's transactions during the week for which the budget report is made. You will get pink copies for all 1250s, not just consumables, but only the costs of consumables will be charged against your budget. Aside from the budgeting considerations, the pink copies of the NAVSUP 1250s will include the requisition numbers that the supply department used in ordering not-carried and not-in-stock material from the supply system. It's a good idea to maintain an informal file of these NAVSUP 1250s for outstanding material. It gives you a picture of what material you have outstanding, and it provides requisition numbers which will make it easier for the supply department (and quicker for you) to determine the status of outstanding material in which you have a particular interest. Periodically, you should scrutinize your outstanding file. You may come across material that you no longer need. If you cancel the request, your departmental budget will be credited with the dollar value of the requisition when a system cancellation is affected. Or you may find that there has been a foul-up somewhere along the line which resulted in cancellation of a requisition for material which you still need.

In concluding this chapter, it is appropriate to reiterate the necessity for you to learn a few mysteries about an afloat supply department and to use what you've learned to secure for yourself better supply support. This chapter has summarized points of contact between you and a nonautomated supply department. If you comply with the letter and the spirit of the suggestions made in this chapter, you will find that your supply department is better able and more willing to provide the service that you rightfully expect from them.

REFERENCE LIST

Afloat Supply Procedures, NAVSUP Publication 485, Naval Supply Systems Command, Washington, D.C., February 1984.

Master Repairable Item List (MRIL), NAVSUP Publication 4107, Naval Supply System Command, Washington, D.C., June 1984.

Storekeeper 3 & 2, NAVEDTRA 10269-K, Naval Education and Training Program Development Center, Pensacola, FL, rev. 1983.

CHAPTER 6

AMMUNITION

A textbook for weapons officers would be incomplete without reference to ammunition. In this chapter we will discuss general types of ammunition without attempting to describe their individual peculiarities. A more detailed description may be found in *Ammunition Afloat*, OP 4, and to a lesser degree, in the series of two Naval Training Command officer texts: *Principles of Naval Ordnance and Gunnery*, NAVEDTRA 10783-C and *Principles of Guided Missiles and Nuclear Weapons*, NAVEDTRA 10784-B. In addition, there are also the individual ordnance pamphlets (OPs) and ordnance data (ODs) that describe in detail particular munitions and their packaging, handling, and testing. The most important area to be discussed in reference to ammunition is safety. Helpful information related to replenishing and storing ammunition will also be discussed. Of particular interest in this area is the standard replenishment alongside method (STREAM), a method for transferring missiles at sea; the major coverage of this system will be in a later chapter.

ORDNANCE SAFETY

The basic regulations for handling and safety requirements of ammunition and explosives are contained in OPNAVINST 8023.2, *U.S. Navy Explosives Safety Policies, Requirements, and Procedures*.

Implementing the proper safety precautions should not be just another order to be carried out, but "a way of life," so ingrained in personnel as to be second nature.

Printed safety precautions alone, however, cannot prevent accidents. Safety consciousness must be instilled by constant supervision, careful instructions, and adequate training; for safety is both the result and the reflection of good training. The two are inseparable. A well-trained crew is a safety-minded crew. It has been shown beyond any doubt that proper safety training saves an untold amount of dollars and lives.

Sometime in the future, somewhere at sea, a man will be careless with explosives. He may be too tired, too sure of himself, or too ignorant of the danger. In any event, this carelessness may cost him his life or the lives of many of his shipmates; it may even destroy the ship. No better illustration of this exists than the case reports in *Ordnance Safety Precautions, Their Origins and Necessities*, OP 1014.

When properly handled, ordnance equipment is no more dangerous than an automobile properly handled. But great precaution must be taken with guns, missile launchers, missiles, and all types of ammunition. They are designed to destroy and kill. Safety precautions for guns and other weapons must be observed; they are danger signals, rules for staying alive.

Some of the existing precautions are the result of casualties that occurred many years ago. Others are the result of intelligent imagination and forethought. Regardless of the way the safety precautions came about, they must become a part of everyone's life in the Navy.

Safety precautions are issued for a purpose, the purpose of saving lives and equipment. Guns, missiles, and explosives are not toys; mistakes mean death. Every piece of ordnance equipment is potentially dangerous. But when safety precautions are followed, danger can be held to a minimum.

There are many publications written on safety. The OPs on guns, mounts, missile launching systems, and other ordnance equipment contain sections on safety. It is important for you to read and understand these precautions and to set up instructions based on them. One worthwhile general publication governing safety in the handling and storage of munitions in the Navy is *United States Navy Ordnance Safety Precautions*, NAVSEA OP 3347.

SAFETY PRECAUTIONS

All personnel required to handle ammunition must be carefully and frequently instructed in safety precautions, methods of handling, storage, and uses of all kinds of ammunition and explosive ordnance with which the vessel, aircraft unit, or station may be supplied. No one should be permitted to inspect, prepare, or adjust live ammunition and explosives until that person thoroughly understands the duties, the precautions, and the hazards involved. To be noted especially from the foregoing is "carefully and frequently instructed." There won't be many situations that will not lend themselves to some form of safety instruction. Don't miss any opportunity, formal or informal, to instruct. It is fairly obvious that you cannot instruct anyone else unless you are well versed in the subject matter yourself.

There are certain activities never permitted in a magazine. These are as follows:

- Use of heat and heating devices. Before performing any work that may cause either an abnormally high temperature or intense local heat in or adjacent to a magazine or other compartment used primarily as a magazine, all explosives must be removed to other safe storage until normal conditions have been restored. This provision includes work requiring use of cutting or welding torches or similar appliances in or near the magazine, steam out of oil tanks and compartments, and so forth.

- Fuzing or unfuzing of bomb-type ammunition must not be done in or near magazines. Detonators, boosters, primer detonators, or other firing mechanisms must not be assembled into or removed from bombs, warheads, mines, depth charges, demolition charges, hand grenades, or other types of ammunition in or near magazines. Such operations must be done on one unit at a time, as near practicable to the rack, tube, or other launching or dropping devices.

- Smoking or carrying lighted cigars, cigarettes, pipes, and so forth in a magazine area is strictly forbidden. Carrying matches, lighters, open flame, or fire into a magazine or magazine area is strictly forbidden.

- As a general policy, assembly operations of missile sections and/or appurtenances must only be permitted in authorized spaces.

It is not the intent of this section to cover specifically all the safety precautions dealing with particular ammunition and associated equipment. These are covered in the OPs, ODs, and technical manuals pertaining to specific ammunition, or classes of ammunition, and their associated equipment. For example, a complete round for a guided missile has specific safety precautions associated with it. These specific precautions are spelled out in the OPs and are cited before descriptions of operations involving personnel and equipment hazards. These safety precautions are much more detailed than those relating to guided missiles and rockets in NAVSEA OP 3347, *U.S. Navy Ordnance Safety Precautions*. It should be noted that the safety precautions cover more than just the handling and storage of the particular ammunition. They cover every possible source of danger to the weapon itself, to the system that handles it, and to the personnel working with it.

Three general rules that should be second nature to every naval officer are as follows;

1. Don't handle ammunition carelessly, roughly, or excessively.
2. Don't permit smoking, or any spark or flame-producing material in any area where ammunition is being stored or handled.
3. Ensure that everyone engaged in any servicing or handling operation is responsible for the safety of personnel and equipment.

A listing of sources of general safety precautions may be found in the Index of Ordnance Publications. One of the more important manuals is the technical manual, *Radio Frequency Hazards to Ordnance, Personnel, and Fuel*, NAVSEA OP 3565.

Safety precautions for nuclear weapons are covered in special weapons ordnance publications (SWOPs) 20-(series) SRD. Before any operations are started involving these munitions, all applicable safety precautions (including cautions and warnings) must be read and understood by all personnel involved, and they must be instructed and drilled in them. Not only the spirit of the regulation must be followed, but also the letter.

Safety precautions will be posted in the spaces where ammunition operations are being performed. The precautions mentioned above are applicable not only to nuclear weapons and associated equipments, but also to all other ammunition, handling and launching systems, and associated test equipments. Of course some precautions, because of their security classification, cannot be posted in free access areas, and others even in controlled access areas. But these safety precautions generally relate to the internal servicing of the particular ammunition and not to its handling, and they normally are contained in the publication governing the operation being performed.

NONNUCLEAR ORDNANCE/ EXPLOSIVES HANDLING QUALIFICATION AND CERTIFICATION PROGRAM

In the past, improper processing, handling, loading, or testing of explosive devices have caused mishaps that have resulted in injury, loss of life, or damage to property, as well as reduced operational effectiveness of both fleet and shore activities. By investigations, one major source of mishaps with explosive devices has been shown to be personnel error. Analysis of mishaps clearly caused by personnel error indicates that the following reasons are most commonly encountered:

- Lack of effective use of available training or lack of knowledge on the part of individuals and teams who handle explosive devices

- Lack of necessary and effective leadership and supervision by the supervisory personnel directly responsible for operations involving explosive devices, both ashore and afloat

- During high tempo operations where maintenance of safety for explosives tends to be degraded as a result of fatigue, shortcuts to get the job done on time, or complacency stemming from rapid, repeated, and often monotonous tasks

- Loss of continuity caused by the discharge, transfer, promotion, or retirement of experienced personnel; or the improper duty assignment of personnel whose precise qualifications and experience are generally unknown

- During certain evolutions, the temporary assignment of personnel to perform ordnance-related tasks for which they are not specifically qualified

- Failure to follow or maintain current, standard operating or job procedures that have been established for specific processes or evolutions involving explosives or explosive devices

The purpose of the Nonnuclear Ordnance Explosives Handling and Certification Program is to ensure that each person is certified before performing any task involving explosives. An explosives handler must be certified by the command or organizational unit to which the handler is assigned. Certification requires a satisfactory demonstration of one's personal qualifications to perform safely all required functions, tasks, or evolutions involving the explosives being handled. Security, aircrew, working personnel, and watch personnel may be exempt from personal or team qualification. However, each person must have been carefully instructed in the safety precautions and regulations governing the function, task, or evolution to be performed.

Certification Boards

A certification board must be appointed by the commanding officer or officer in charge of each unit or naval activity involved with explosives or explosive devices. As a minimum, the board must include the responsible department head (or comparable supervisory representative in those organizations without defined departments) and not less than one individual with a pay grade of E-6 or senior (or equivalent civilian supervisor) who is certified to perform the function, task, or evolution under consideration. In large units or activities, such as aircraft carriers or weapons stations/ammunition depots, the responsible department head may delegate, with the concurrence of the commanding officer, the responsibility for certification to an appropriate officer or supervisor. A commanding officer/officer in charge may augment the certification board with additional personnel from outside or within the command. In smaller units or activities where a certified individual with pay grade E-6 (or senior) is not assigned to the command, and where board augmentation from outside the command is not feasible, the type commander may authorize a waiver of the pay grade E-6 requirement.

Initial certification of personnel to perform particular explosive-related jobs may be necessary in those instances where no certification board is currently established. Examples are a newly installed weapons system, the addition of a handling and/or storage capability, or a newly commissioned ship. In most cases, experienced supervisory-level personnel will be qualified for certification. After careful review by the department head (or equivalent supervisor) of all available information relating to the individual's qualifications for the job to be performed, and a personal interview, a recommendation will be made to the commanding officer or officer in charge. Certification will be at the discretion of the commanding officer or officer in charge. When sufficient personnel have been qualified in this manner to form a full qualification and certification board, certification procedures will be conducted.

Personnel Qualification

Personnel must be qualified as team members, as individuals, as team leaders, as instructors, as safety observers, or as quality assurance members. Because of numerous weapons, launching devices, and weapon fuzing and loading configurations, explosive devices are segregated into representative family types (see table 6-1). An individual must only qualify and be certified for applicable family types and operational situations.

Generally, only inert ordnance is used for drill or training purposes. If a training device is not available or if an explosive device for which training is required has no inert model, then a closely related family-type inert device must be used for training. Training aids, such as mockups, pictures, manuals, exploded views, and films, may also be used effectively. When the use of either family-type devices or training aids are not considered to be a viable alternative for hands-on training with a noninert device, and all safety factors have been carefully weighed, the type commander may authorize hands-on training with explosive devices, but only under qualified supervision.

For each evolution to be performed, qualification must be accomplished through proficiency demonstrations before a certified member of the certification board. Knowledge and competent use of applicable documentation and knowledge of ordnance safety precautions and procedures must be demonstrated to the extent deemed necessary for ensuring compliance with sound handling practices and safety instructions.

Personnel must be knowledgeable with respect to all types of explosive devices with which they may be required to work. Accordingly, qualification and certification will be necessary for each separate operation and each explosive device not in the same family type.

Certification

Upon being qualified and recommended for certification, each person must be issued final certification by the commanding officer, officer in charge, or the designated head of the certification board. An appropriate entry will then be made in the individual's training record.

The following personnel require individual qualification and certification as follows:

- Personnel whose duties require that they individually handle, inspect, package, unpack, assemble, disassemble, test, fuze, load or down load, stow, or arm or dearm explosives or explosive devices must be qualified and certified for such tasks. Personnel assigned as safety observers for explosive operations and those personnel who inspect explosive operations for quality assurance purposes must also be qualified and certified. Supervisors of explosive operations and members of the command-appointed certification boards must also be individually certified for the evolutions that they may supervise or observe for qualification purposes. The only exception to this provision is that supervisors of explosives handling teams involved in the handling of explosives or hazardous materials with power-operated handling equipment need not themselves be qualified as operators. They must, however, be certified as team leaders for the explosive operations being conducted.

- All operators of power-operated handling equipment (hoists, winches, cranes, forklifts, and so forth) used in transporting, loading, or handling ammunition, explosives, and other hazardous materials must be both certified and licensed as ground support equipment and/or materials handling equipment operators.

- Instructors of formal courses or command-approved courses in any of the functions, tasks, or evolutions involving explosives.

Team qualification and certification are required for personnel whose duties require handling, inspection, packaging, unpacking, assembly, disassembly, testing, fuzing, loading or down loading (aircraft, launchers, torpedo tubes, and so forth), stowing, or arming or dearming of explosives or explosive devices while acting as members of a team or work group must be qualified and certified for the evolutions involved. Additionally, a team leader must be designated

Table 6-1.—Families of Explosive Materials/Ordnance/Operations

Families of Explosive Materials	Families of Explosive Ordnance	Families of Explosive Operations at Weapons Stations/Depots	Families of Fleet-type Explosive Operations
1. Primary or initiating explosives 2. Booster explosives 3. High explosives (HE) 4. Demolition and miscellaneous explosives 5. Propellants 6. Pyrotechnics and incendiaries 7. Chemical material 8. Other hazardous materials	1. Gun ammunition 2. Rockets and projector charges 3. Bombs 4. Torpedos 5. Mines 6. Guided missiles 7. Landing force and artillery ammunition 8. Pyrotechnic devices 9. Explosive devices (line charges, cable cutters, explosive bolts, fuzes, etc.) 10. Demolition materials (primacord, time fuze, demolition charges, initiating devices, etc.)	1. Cast loading explosives (bombs, mines, torpedo warheads, projectiles, bomblets, guided missile warheads) 2. Press loading of explosives (projectiles, pellets, boosters, guided missile warheads) 3. Propellant grain manufacture 4. Chemical ingredient preparation 5. Forming and processing pyrotechnic and incendiary materials 6. Testing explosives and ammunition devices containing explosives 7. Receipt, segregation, storage, and issue functions 8. Maintenance, renovation, and rework 9. Materials handling of ammunition, explosives, and dangerous articles or materials 10. Demilitarization 11. Disposal 12. Loading, offloading, stowing, blocking, and bracing	1. Aircraft loading/arming 2. Torpedo handling/maintenance 3. Missile system cycling 4. Gun system cycling 5. Handling and stowage of ordnance Miscellaneous operation 1. Operation of explosive actuated tools

and appropriately qualified and certified. Personnel changes in certified teams must be kept to a minimum. Requalification or recertification of a team after personnel changes have occurred is at the discretion of the commanding officer or officer in charge. Shipboard gun crews are considered to be teams for the purposes of qualification and certification.

Contractor personnel required to perform any of the functions discussed in this chapter at a naval activity must provide to the commanding officer or officer in charge documentation that verifies the qualification and certification level of personnel before they perform such functions. All contracts, when issued and also when renewed, that deal with explosives and explosive operations will have a provision stating that personnel used for explosive-type operations must be qualified and certified for the type of operation to be performed.

Table 6-2 lists the qualification levels and the minimum standards for qualification.

Certification, unless revoked for cause, is valid for a maximum period of 12 months. A renewal of the certification, whether issued at the time of expiration or later, should be granted only after the individual or team qualification has been validated by the certification board. Whenever possible, complete requalification should be accomplished before certification is renewed.

Revocation of Certification

Commanding officers and officers in charge are responsible for the revocation of individual and team certifications whenever such action is deemed to be in the best interest of safety. Revocation of certification for individuals and/or teams, including the team leader, however, is mandatory in the event an explosive mishap is caused by failure to follow authorized procedures. Flagrant disregard of safety precautions, reckless operation of equipment used to handle explosive devices, or other behavior indicating incompetence or unreliability is also cause for mandatory revocation of certification. In this respect, it should be recognized that ordnance incidents or mishaps can and do happen through inadvertent acts, carelessness, and minor rule infractions as well as through deliberate acts, negligence, and major rule infractions. When the commanding officer considers such action appropriate, personnel whose certification has been revoked must be retrained until requalified and recertified. If, however, the demonstrated behavior of the person indicates that such retraining may be ineffective, the individual must be assigned other tasks not involving explosive devices. Revocation of certification of military personnel for cause requires an entry in the individual's service record stating the specific reason for the revocation.

Transfer of Certification

For military personnel transferred to another activity, the acceptance of a certification related to an explosive device will be at the discretion of the commanding officer or officer in charge of the receiving activity. The transferring activity must enter in the service record the individual's qualifications and dates of certification or decertification for specific evolutions involving explosive devices. Civilian employees who transfer to another activity must be recertified before being allowed to handle any explosive devices. If civilian employees transfer to another function within the same activity they must be certified for the new function (unless they currently hold a valid certification for that function).

The requirements for certification, revocation, and transfer of certification of nonnuclear ordnance explosives handlers are contained in OPNAVINST 8023.2.

Two-Man Rule

The two-man rule is defined in OPNAVINST C5510.83. It is a security measure in relation to nuclear weapons and their components, including nuclear warheads. The two-man rule requires that a minimum of two authorized persons, each capable of detecting incorrect or unauthorized procedures with respect to the task being performed and familiar with pertinent security requirements, be present during all operations that require admittance to any portion of nuclear weapon delivery system that could permit its launching, arming, firing, or releasing.

When performing any work involving nuclear warheads, obey the two-man rule. The personnel must be familiar with Navy SWOPs that spell out the details of caring for nuclear weapons. Great care must always be used not to bump or drop the warhead. That means all handling equipment must be in safe operating condition, and that enough personnel are available to safely do the work. Check the operation of the handling equipment before using it.

Table 6-2.—Qualification Levels and Minimum Standards for Certification

QUALIFICATION LEVEL	QUALIFICATION STANDARD
TEAM MEMBER (TM)	1. BASIC. Personnel are aware of basic safety precautions relative to the work task and explosive devices concerned, have received formal and/or on-the-job training, and have been receommended by their immediate supervisor. NOTE: TM qualified personnel will perform in team concept only under supervision of a team leader.
INDIVIDUAL/TEAM LEADER (I/TL)	1. Same as BASIC for TM (above). 2. Has sufficient knowledge and has demonstrated the proficiency to be entrusted with performing the work task alone and/or to direct the performance of others in safe and reliable operations. 3. Capable of interpreting the requirements of applicable checklists and assembly/operating manuals.
QUALITY ASSURANCE (QA)	1. Same as INDIVIDUAL/TEAM LEADER above. 2. Has detailed knowledge of applicable inspection criteria for the explosive device/system. 3. Is able to determine: (a) whether an explosive device/system is functioning properly while it is being used, and (b) that the necessary assembly or installation procedures have been complied with applicable directives.
INSTRUCTOR (IN)	1. Same as INDIVIDUAL/TEAM LEADER above. 2. Has developed the necessary skills to instruct others and is providing formal training using an approved course of instruction.
SAFETY OBSERVER (SO)	1. Must have sufficient knowledge of safety procedures and functioning of safety devices to determine subsequent reaction if procedures or safety devices are not properly used.

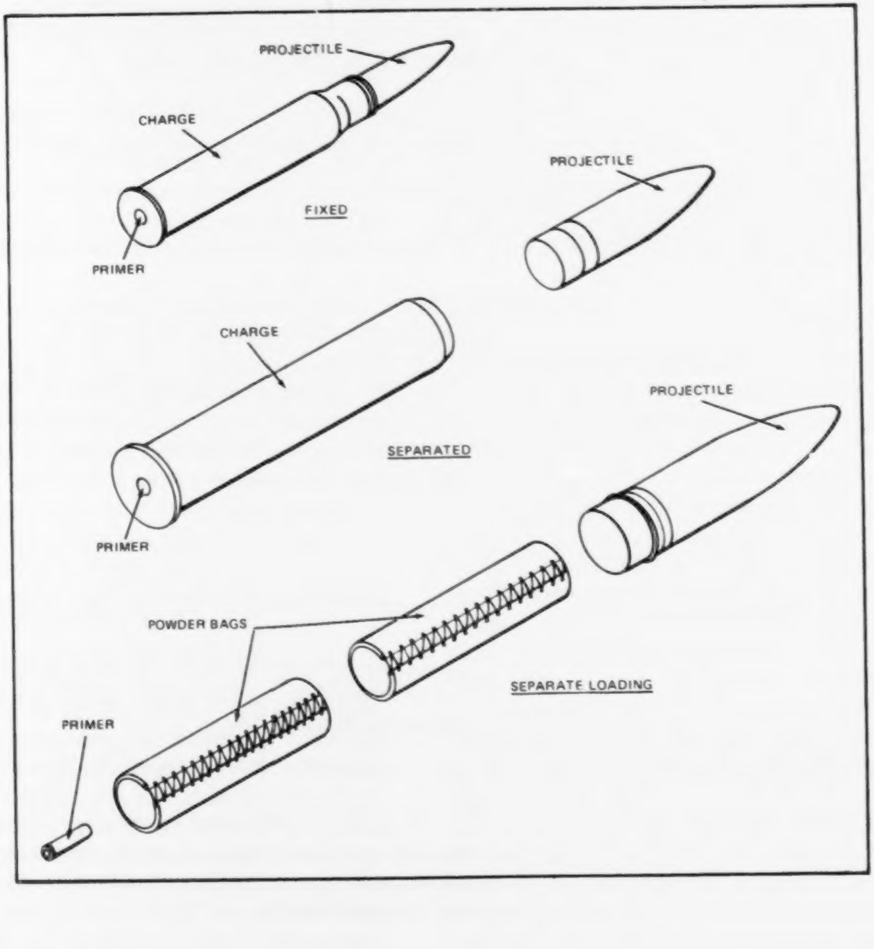
AMMUNITION

Ammunition is the complete assemblage of the component parts of ammunition details that, together, make up a charge or round for any type of weapon. Shipboard explosives include not only primers, boosters, detonators, powder, powder bags, cases, fuzes, projectiles, demolition materials, and so forth, but also missiles and their associated warheads, torpedoes, and nuclear weapons among the more notable assemblages. It should be readily apparent that a complete round of any ammunition may contain both low explosives and high explosives, depending upon their function in the complete round. Remember, the arbitrary distinction made as to whether an explosive is low or high doesn't make it less dangerous to handle.

Ammunition may be classified in several categories, some of which are service use, purpose, and construction. Projectiles are commonly classified by the size of the gun in which they are used. In addition to the designation of bore diameter, such as 3- or 5-inch, the length of the gun bore in calibers is also used as a means of classification.

Perhaps a few definitions are in order so that a clear delineation may be made of what is meant by the term *explosive*. An explosive is a substance that, when subjected to a suitable initiating impulse, undergoes a sudden chemical change characterized by the liberation of heat, blast, and light, and the formation of products that are mainly gaseous.

A hard and fast classification of explosives is difficult to formulate without exceptions. One



63.91

Figure 6-1.—Types of gun ammunition: fixed (top); separated (center); and separate-loading (bagged gun) (bottom).

procedure is to classify explosives according to the speed at which their chemical transformation takes place. Thus, low explosives are relatively slow acting when compared to high explosives that react with extreme rapidity.

Another form of explosive energy is used as distinct from those using a chemical transformation to obtain the desired results. A nuclear weapon is any military device using energy derived from nuclear fission or from a combination of nuclear fission and fusion. These types of explosives rely on a basic change in the matter structure to derive heat and blast with the added product or radiation both visible (light) and invisible (alpha, beta, and gamma rays).

For a better understanding of ammunition, refer to NAVSEA SWO10-AB-GTP-010 (*United States Navy Ammunition, Historical and Functional Data*).

AMMUNITION TYPES

As detailed in chapter 2 of NAVSEA OP 5 (*Ammunition and Explosives Ashore Storage Data*) and NAVSEA OP 4 (*Ammunition Afloat*) all ammunition and explosives must be stored by storage compatibility group or type (SCG). These groups or types consist of the following:

1. Gun Ammunition
2. Small Arms
3. Artillery
4. Grenades
5. Land mines
6. Bombs
7. Rockets
8. Pyrotechnics and marking devices
9. Chemicals
10. Demolition
11. Torpedo and depth charges
12. Underwater sound signals
13. Underwater mines
14. Bulk explosives
15. Guided missiles
16. Special cartridges

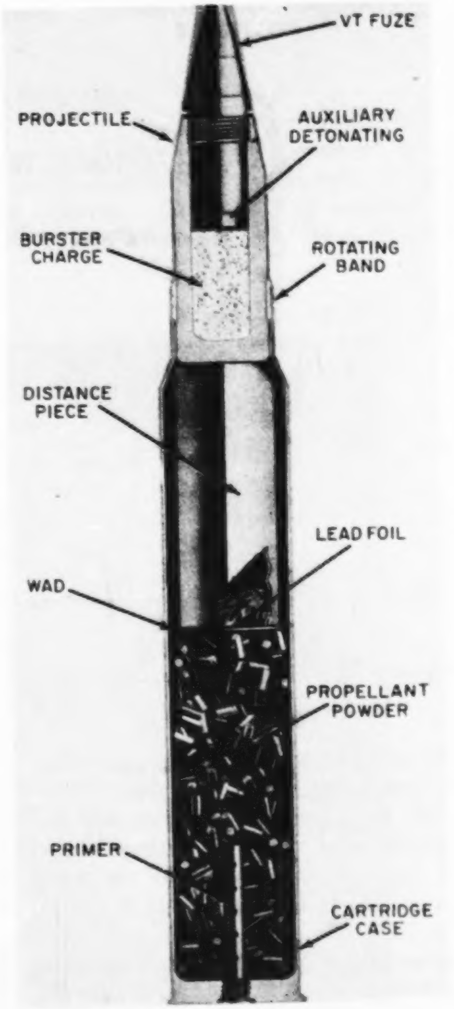
Because of the special storage requirements placed upon nuclear weapons, they are purposely not included here. Theoretically, however, nuclear weapons fall within one of the above categories if one category was designed for the particular use noted.

Not all of the groups or types of ammunition listed will be discussed in this chapter; a few have been selected and will be discussed but not in great detail. For a more detailed discussion, refer to NAVSEA SWO10-AB-GTP-010 (*United States Navy Ammunition, Historical and Functional Data*).

GUN AMMUNITION

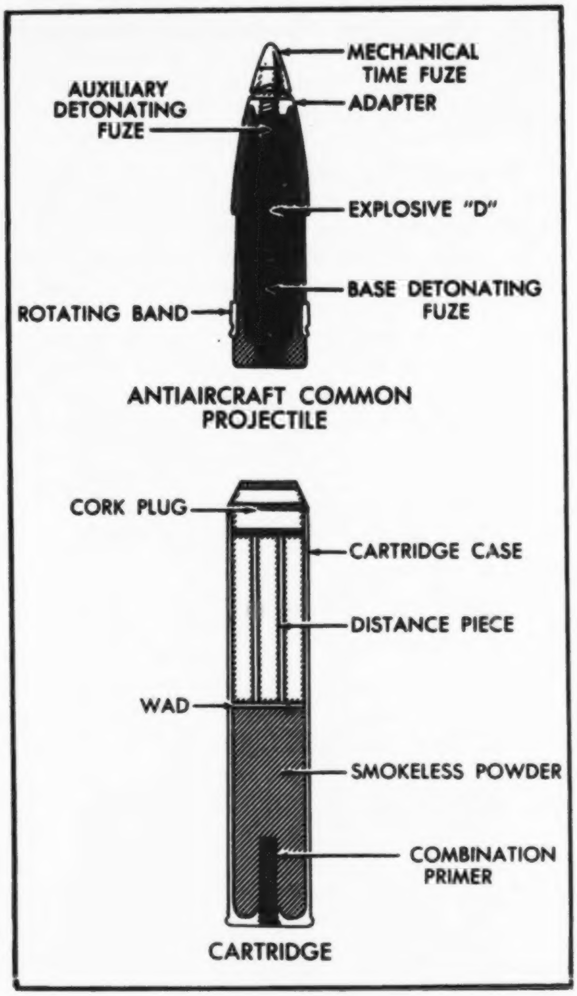
The propelling charges for gun-type ammunition fall into three types: fixed, separated, and separate loading (bag-type) (fig. 6-1).

In fixed ammunition, the components are assembled into one unit (fig. 6-2). The projectile



84.9

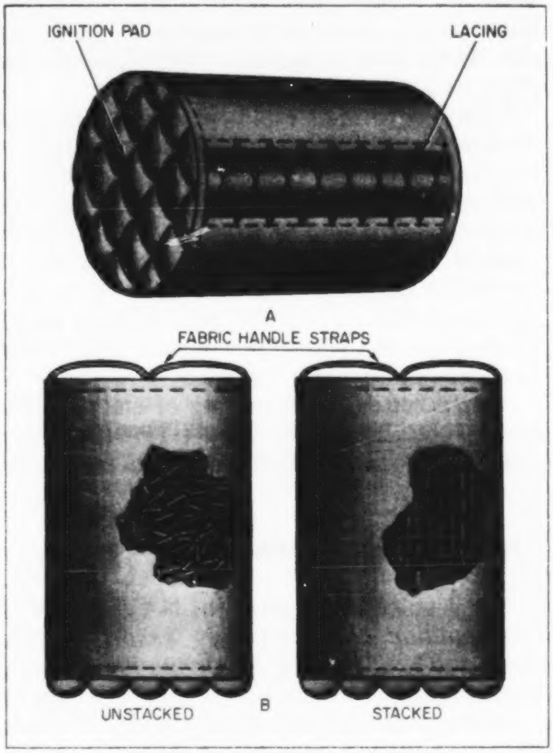
Figure 6-2.—Typical round of fixed ammunition, cartridge case assembled with projectile, sectional view.


MECHANICAL TIME FUZE
AUXILIARY DETONATING FUZE
ADAPTER
EXPLOSIVE "D"
BASE DETONATING FUZE
ROTATING BAND
ANTIAIRCRAFT COMMON PROJECTILE
CORK PLUG
CARTRIDGE CASE
DISTANCE PIECE
WAD
SMOKELESS POWDER
COMBINATION PRIMER
CARTRIDGE

3.117

Figure 6-3.—5"/38 ammunition (separate loaded).

is crimped into the top of the propelling charge case, and the primer is assembled in the base of the case. In separate loaded ammunition (fig. 6-3), the primer and propelling charge are contained in a case as one unit, and the projectile is separate. In bag-type ammunition, the bag charge (propellant) (fig. 6-4), primer, and projectile are separate units. In case ammunition, the primer (fig. 6-5) is assembled in the propelling charge case. Bag-type ammunition requires another method of containing the primer. Here the primer is inserted in a firing lock attached to the breech block mushroom stem. Flame from the primer is directed to the base of the bag charge through a hole in the mushroom stem.


IGNITION PAD
LACING
A
FABRIC HANDLE STRAPS
UNSTACKED
B
STACKED

84.7

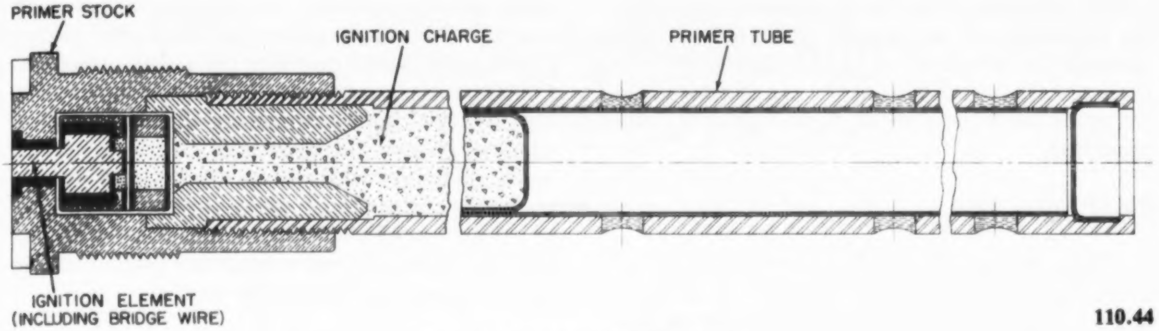
Figure 6-4.—Powder bags.

SPECIAL PURPOSE PROJECTILES

These projectiles are not intended to inflict damage by explosion or by fragmentation. Their construction incorporates no strength other than that required to withstand discharge from the gun without damage to the contents. If the filler includes any explosive, it is a small black powder charge designed to expel the contents of the projectile. The following groups of projectiles belong to this class: illuminating, smoke, gas, incendiary, chaff, nonfragmenting, dummy drill, target (blind loaded), and proof-shot.

Illuminating Projectiles

Illuminating projectiles (fig. 6-6), often termed star shells, are used to illuminate a target in darkness. The projectile contains an illuminating assembly and a parachute


PRIMER STOCK
IGNITION CHARGE
PRIMER TUBE
IGNITION ELEMENT (INCLUDING BRIDGE WIRE)

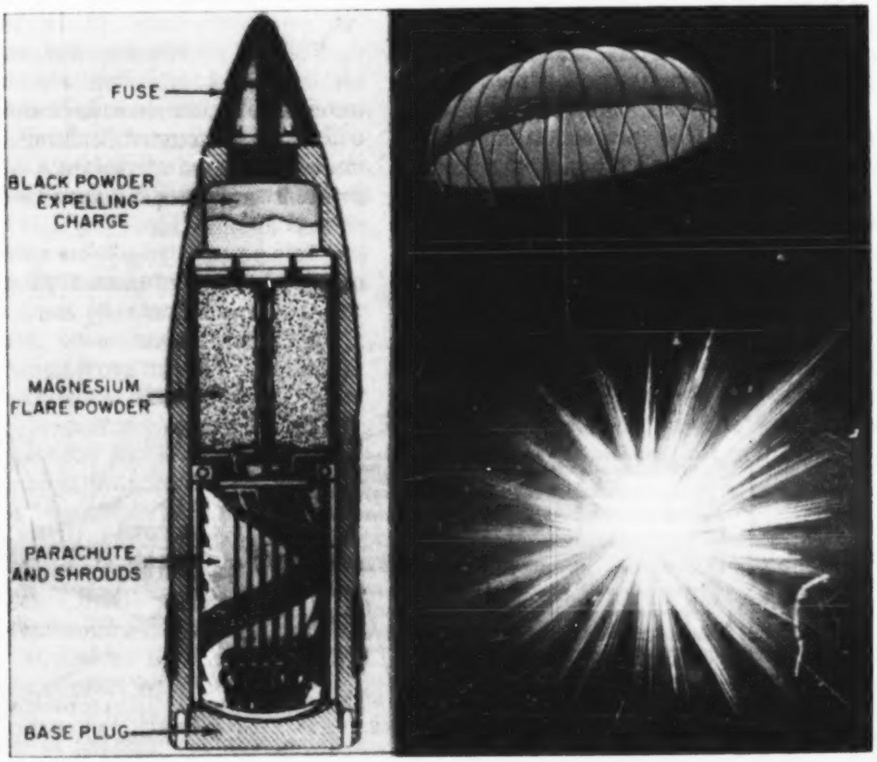
110.44

Figure 6-5.—Case electric primer.

assembly. At a predetermined time in the trajectory of the projectile, the black powder expelling charge expels the flare and parachute assembly, and lights the flare. The flare burns with a brilliant light as the parachute descends.

Smoke Projectiles

These projectiles include a number of different types, depending on the type of fuze, type of contents, and method of loading. For example, the white phosphorus (WP) projectile


FUSE
BLACK POWDER EXPELLING CHARGE
MAGNESIUM FLARE POWDER
PARACHUTE AND SHROUDS
BASE PLUG

84.11.1:110.47.1

Figure 6-6.—Illuminating projectile.

(fig. 6-7) contains tubes of white phosphorus that are expelled by a small black powder charge. After a slight delay the tubes burst and are scattered by the explosion of the burster tube that extends through the container at the center of the WP filler tubes. When the tubes are shattered, a screening smoke and slight incendiary effect are produced.

Chaff Projectiles

These projectiles (fig. 6-8) contain metal foil strips that, when scattered high in the air by a small expelling charge, serve to confuse enemy radar operators. For more detailed information on ammunition refer to OP 2238, *Identification of Ammunition, and Navy Gun Type Ammunition* (SWO30-AA-MMO-0107).

Biological/Chemical Ammunition

This type of ammunition may include projectiles, bombs, grenades, or other containers (tanks), and may be designated as to the type of container. This type of ammunition may produce smoke, fire, gas, or biological elements. Also, free fluids or gases released from aircraft tanks, projectors, or sprayers are designated as biological/chemical ammunition. Unless specifically authorized by CNO, chemical ammunition classified as lethal or incapacitating must not be carried aboard ship. When authorized, NAVSEASYSCOM will provide detailed instructions and personnel trained in handling them. Chemical lethal or incapacitating weapons may not be stowed with conventional explosives without specific approval of NAVSEASYSCOM. Ships and shore activities that stow and handle lethal or incapacitating chemical weapons have a competent safety officer assigned who plans, coordinates, and supervises the safety program. Post handling instructions, safety precautions, and emergency procedures in all spaces where lethal or incapacitating munitions are stowed or handled. Safety watches must be posted during all phases of handling in which the operator's view of the load or of obstructions is hampered. There must be a prearranged evacuation plan in which all personnel are thoroughly drilled.

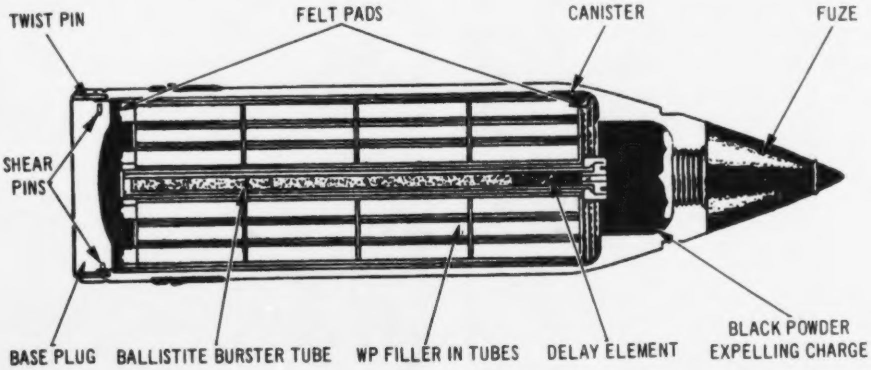
DEMOLITION MATERIAL

Demolition explosives are intended for such uses as blasting, eliminating hazards to navigation and obstacles to amphibious landing, and destroying materials and equipment to prevent capture by the enemy.

NOTE: No personnel shall undertake the setting up of demolition material unless fully qualified by having attended and graduated from a course on demolition.

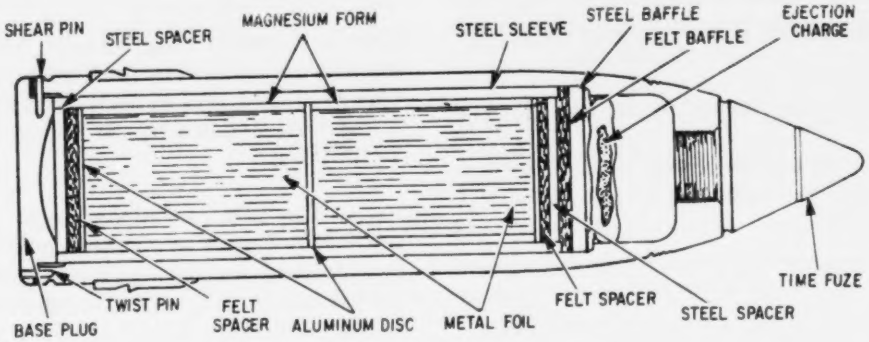
The use of blasting charges is a specialized art requiring intensive training. Demolition techniques are taught in special Navy schools and will not be discussed in detail in this text. For major blasting operations, various forms of dynamite are used, but dynamite normally is not carried aboard ship.

Half-pound demolition charge blocks, consisting of either pressed TNT or cast TNT and



110.47.3

Figure 6-7.—A typical smoke projectile (white phosphorus load), sectional view.



84.302

Figure 6-8.—A typical chaff projectile, sectional view.

tetryl, are issued to ships for general use. Large demolition charges, also consisting of TNT and assembled with half-pound booster charges are also issued for major projects, such as scuttling vessels. The charges of both of these types are detonated blasting caps, set off by electric current, or a blasting time fuze.

In wartime, aboard ship, there are mechanical devices the nature of which, preferably even the very existence of which, must under no circumstances become known to the enemy. Because highly classified instruments must be completely destroyed if capture or abandon ship is imminent, tiny bombs, called destructors, are attached to them, which can be actuated at a moment's notice.

Relatively small quantities of explosives, known as shaped charges, can be made to pierce heavy steel plate by employing them as shaped charges which direct the explosive force into a small and concentrated jet. One important factor in the effectiveness of a shaped charge is the distance of the charge from the target surface at the instant of detonation. This distance, called standoff distance, is necessary to permit effective focusing of the gaseous jet. For more detailed information on demolition materials and the safety precautions pertaining to their use, refer to OP 2212, *Demolition Materials*.

BOMB-TYPE AMMUNITION

Bomb-type ammunition is regarded as thin-walled construction, and is vulnerable to damage by relatively slight contact with either sharp or blunt objects on hard surfaces. This ammunition is regarded as one of the most hazardous types because of its tendency to detonate en masse if subjected to shock or fire. If damaged, it may detonate during normal handling.

Bomb-type ammunition may include aircraft bombs, underwater mines, torpedoes, guided missiles, and other thin-walled containers that are loaded with relatively large bursting charges and cast explosives. For stowage of bomb-type ammunition, refer to NAVSEA OP 4 (table 3-1). For the destruction effect, bomb-type ammunition generally depends upon its destructive blast effect within or near the target, rather than its penetration effect by container fragments.

ROCKETS

The rocket, as a military weapon, functions to aim, launch, and deliver a military payload on a target in much the same way as a gun projectile, but without the need for a heavy and complex fixed gun platform and without the violent recoil associated with the firing of that gun. It accomplishes this function by being a military payload combined with a self-contained propulsion system, which allows it to be launched from aircraft, ships, automotive vehicles, and shoulder launchers. The advantages of the rocket over the gun projectile are twofold:

1. The absence of recoil in launching
2. The simplicity of the launching device

The rocket can thus be fired from a relatively frail and inexpensive device that is simple to manufacture and light in weight. Also a strategic advantage of major importance is the added firepower through the use of many rocket launchers at one time, in places where the size and weight of even one gun of medium caliber would be prohibitive. Against these advantages the disadvantages of the rocket must be balanced:

1. It lacks the accuracy of the gun system

2. When the rocket is launched, there is a violent back blast in the rear of the launcher.

The rocket can vary in size from the small hand-held type to the ASROC (antisubmarine rocket), which contains a warhead or the Mk 46 torpedo.

GUIDED MISSILES

A guided missile is an unmanned, self-propelled vehicle that carries an explosive warhead or other useful payload. It is designed to move in a trajectory or flight path all or partially above the earth's surface. Its trajectory or course while in flight is capable of being controlled by homing systems, inertial guidance, or programmed guidance from within. This excludes drones, torpedoes, rockets, and other vehicles, which have trajectories or courses that cannot be controlled during flight.

Currently, the different types of surface-to-air missiles/surface-to-surface missiles employed by the Navy are few in number so we will limit our discussions to the following missiles:

- Standard missile—It represents the largest group of guided missiles in the SMS arsenal. The Standard missile is available in various configurations. We will limit our discussion to the four basic types listed below:

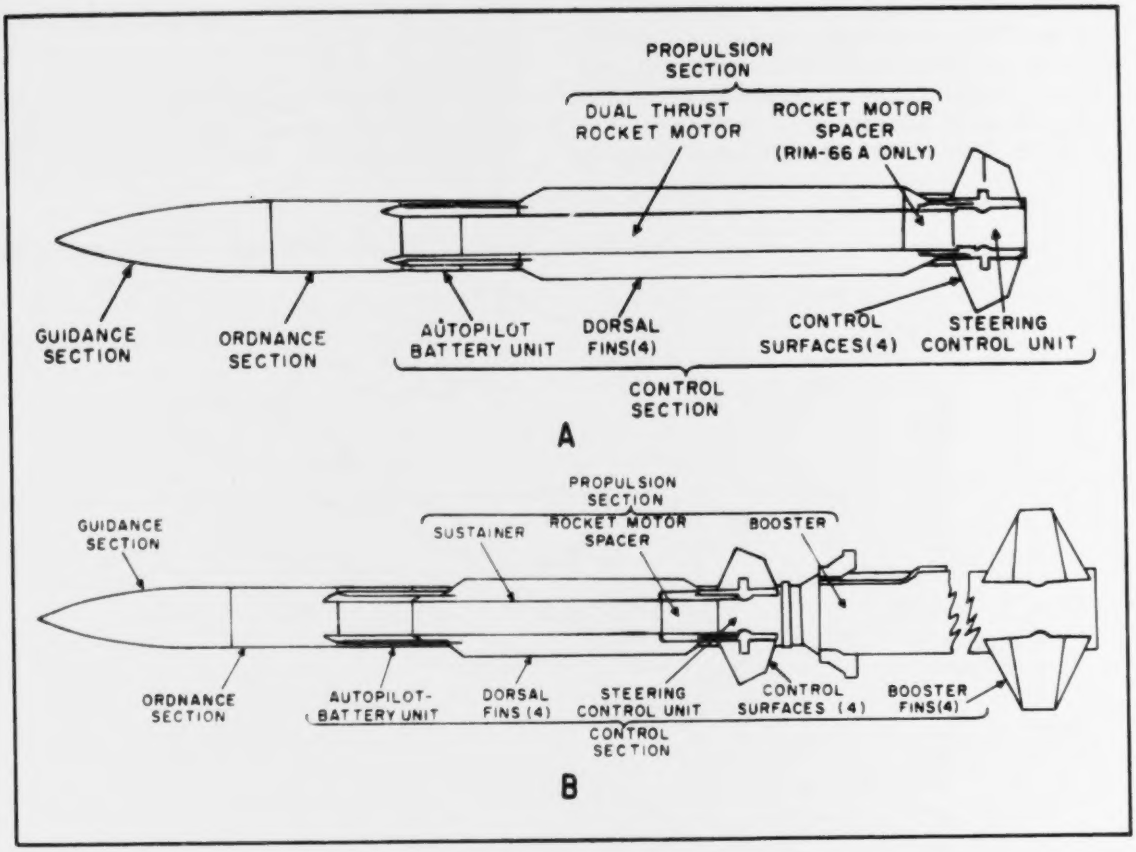
1. SM-1A (MR), RIM-66A
2. SM-1 (MR), RIM-66B
3. SM-1 (ER), RIM-67A
4. SM-2 (ER), RIM-67B

The popular designation of the missile is expressed as SM-1A (MR), SM-2 (ER), and so forth. An SM-1A (MR) round is a Standard, type 1, version or model A, medium range missile. An SM-2 (ER) round is a Standard, type 2, extended range missile. Medium range missiles are handled by the Tartar/Aegis systems (Mk 11, 13, 22, and 26 GMLSs). Extended range missiles are handled by the Terrier systems (Mk 10 GMLSs).

The military designation of the missile is commonly known as a RIM number. The letters R-I-M stand for ship launched aerial intercept guided missile. The various number/letter combinations following RIM identify the missile by type, configuration, and model differences. For example, RIM-67A-5 identifies an SM-1 (ER) missile with improved ECCM capabilities. A RIM-67A-6 has further improvements in its guidance system. Figure 6-9 shows the RIM-66A, RIM-66B, and RIM-67A standard missiles. They are cylindrical in shape with four fixed dorsal fins mounted in line with four independently movable tail control surfaces. The ER booster mounts four additional fixed booster fins. Standard MR and ER missiles may be used against air and surface targets.

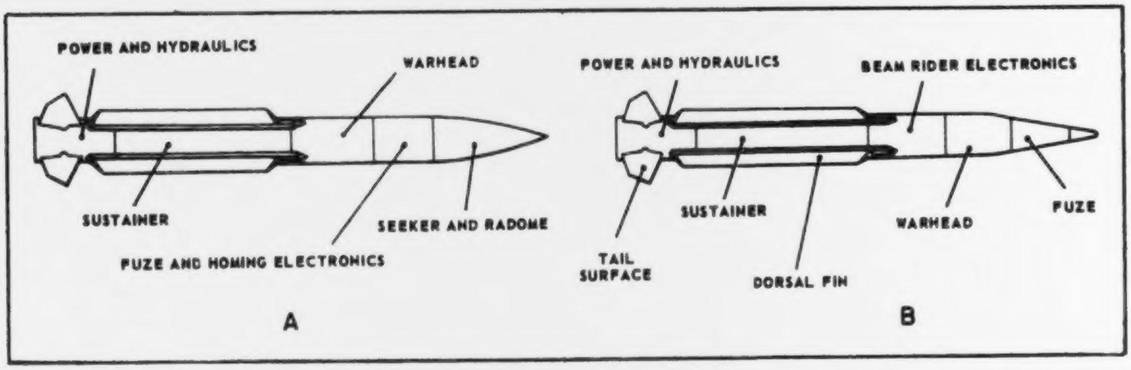
- The Terrier-BT-3 (fig. 6-10)—This missile is a solid-fuel, rocket-propelled, supersonic, surface-to-air/surface missile with greatly increased range capability over the previous models. It has a beam-riding guidance system and uses a conventional/nuclear warhead, detonated by a proximity or command detonate fuze. The missile is controlled throughout flight, both directionally and for roll stabilization, by independently movable tail control surfaces. It has four fixed dorsal fins to provide flight stability.

- Sparrow III—The guided missile for the basic and advanced point defense missile systems is the Sparrow III (Seasparrow) missile, designated for air launch from fighter aircraft. For the basic point defense role, the missile has been modified by the substitution of special wings and tail fins that have less aerodynamic drag. The Sparrow III missile is a supersonic, boost-glide, semiactive homing missile. The tactical mission of the missile is to intercept and destroy enemy aircraft and guided missiles in point defense of individual surface vessels. It also has limited use against surface targets. The basic point defense missile is designated as guided-missile RIM-7 (series) Sparrow III.


PROPULSION SECTION
DUAL THRUST ROCKET MOTOR
ROCKET MOTOR SPACER (RIM-66 A ONLY)
GUIDANCE SECTION
ORDNANCE SECTION
AUTOPILOT BATTERY UNIT
DORSAL FINS(4)
CONTROL SURFACES(4)
STEERING CONTROL UNIT
CONTROL SECTION
A
PROPULSION SECTION
GUIDANCE SECTION
SUSTAINER
ROCKET MOTOR SPACER
BOOSTER
ORDNANCE SECTION
AUTOPILOT-BATTERY UNIT
DORSAL FINS (4)
STEERING CONTROL UNIT
CONTROL SURFACES (4)
BOOSTER FINS(4)
CONTROL SECTION
B

141.234

Figure 6-9.—Major sections and components of the Standard missiles: A. RIM-66A and 66B (MR); B. RIM-67A (ER).

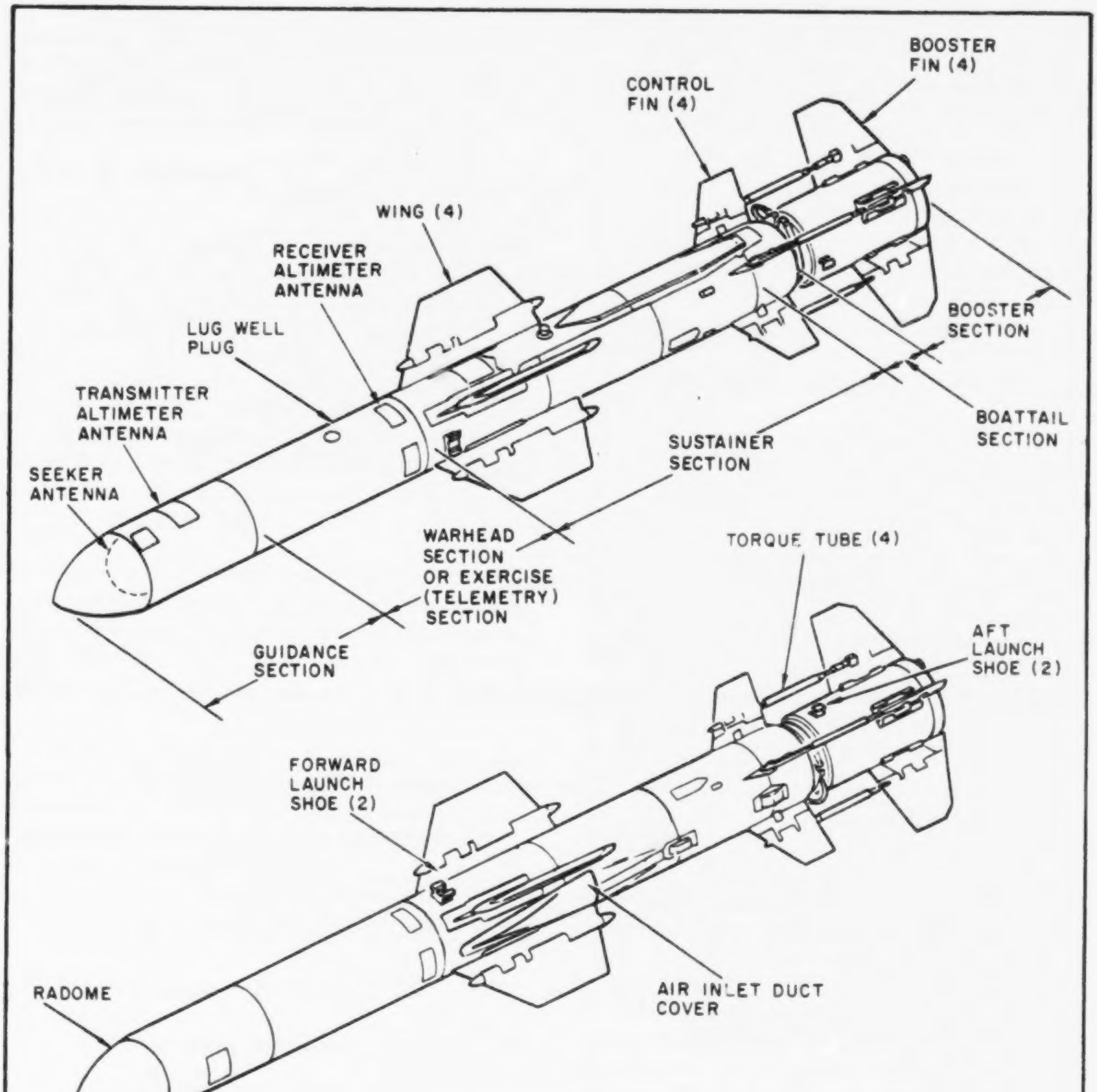

POWER AND HYDRAULICS
WARHEAD
SUSTAINER
SEEKER AND RADOME
FUZE AND HOMING ELECTRONICS
A
POWER AND HYDRAULICS
BEAM RIDER ELECTRONICS
SUSTAINER
WARHEAD
FUZE
TAIL SURFACE
DORSAL FIN
B

141.3

Figure 6-10.—Terrier missile configurations: A. HT; B. BT.

- Harpoon missile—The Harpoon missile (fig. 6-11) is a subsonic, low altitude cruise missile that is only used against surface targets. It is equipped with a self-contained midcourse (cruise) guidance system and employs advanced active homing techniques with countermeasures. The Harpoon missile is designed as an all-up-round (AUR) for all-weather operations. It is capable of engaging over-the-horizon targets.

- Tomahawk cruise missile—This missile is a winged, high subsonic missile that is capable of being launched from a submarine, surface ship,


BOOSTER FIN (4)
CONTROL FIN (4)
WING (4)
RECEIVER ALTIMETER ANTENNA
LUG WELL PLUG
TRANSMITTER ALTIMETER ANTENNA
SEEKER ANTENNA
BOOSTER SECTION
BOATTAIL SECTION
SUSTAINER SECTION
WARHEAD SECTION OR EXERCISE (TELEMETRY) SECTION
GUIDANCE SECTION
TORQUE TUBE (4)
AFT LAUNCH SHOE (2)
FORWARD LAUNCH SHOE (2)
RADOME
AIR INLET DUCT COVER
(VIEW ROTATED 90°)

83.527

Figure 6-11.—Harpoon missile.

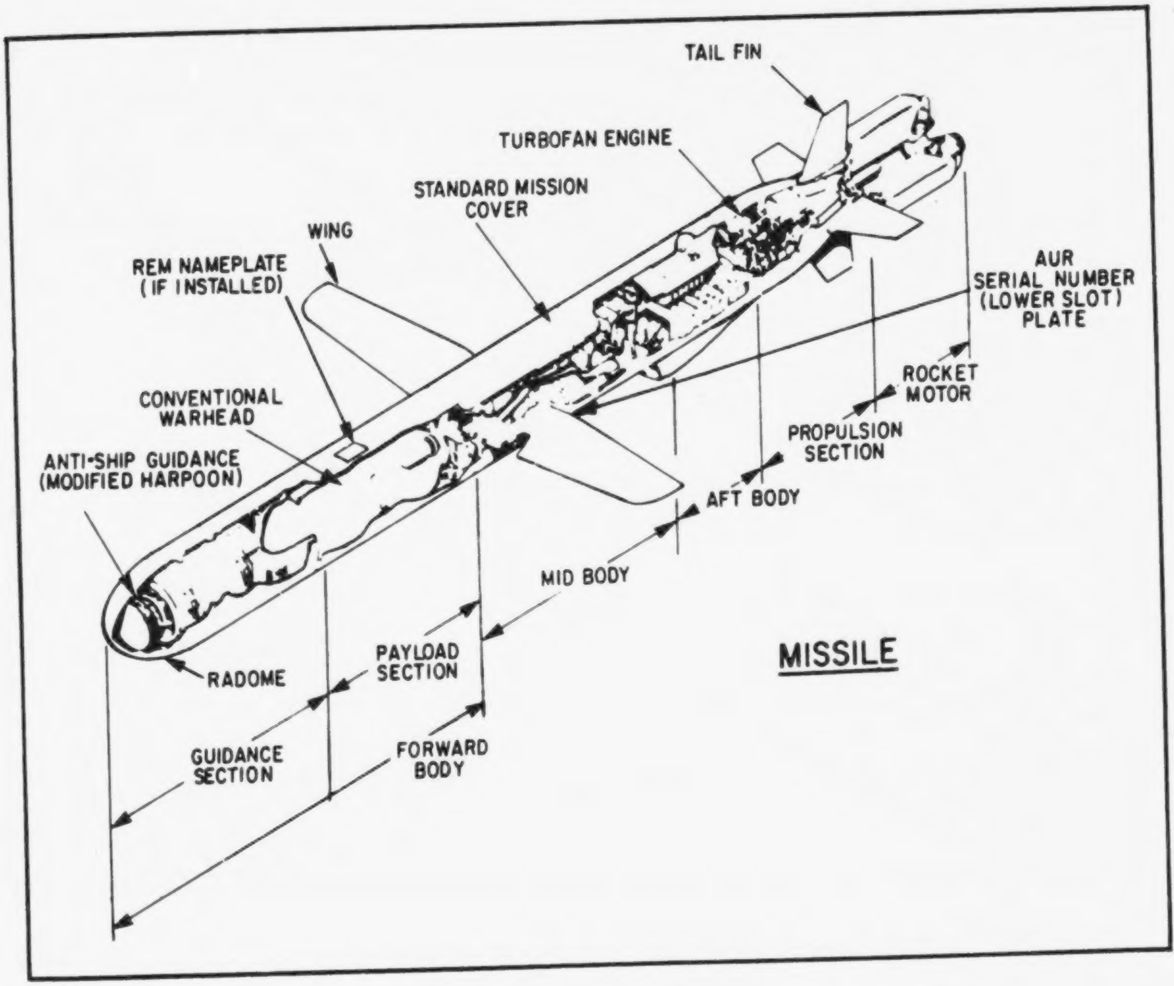
land-based launcher, or aircraft. It is equipped with a solid propellant rocket motor, various underwater protection devices, a terrain contour matching guidance set, and a scene matching area correlation system, and it can carry either a conventional or a nuclear warhead (fig. 6-12).

TORPEDOES AND MINES

In the areas of torpedo and mine warfare, the development continues. The Navy has added new technology to our older weapons. New weapons are in the development stage and are getting ready to make their appearances in the fleet. The submarine continues to be one of our greatest enemies, especially with the development of new sub-to-surface missiles and with the increased range of torpedoes.

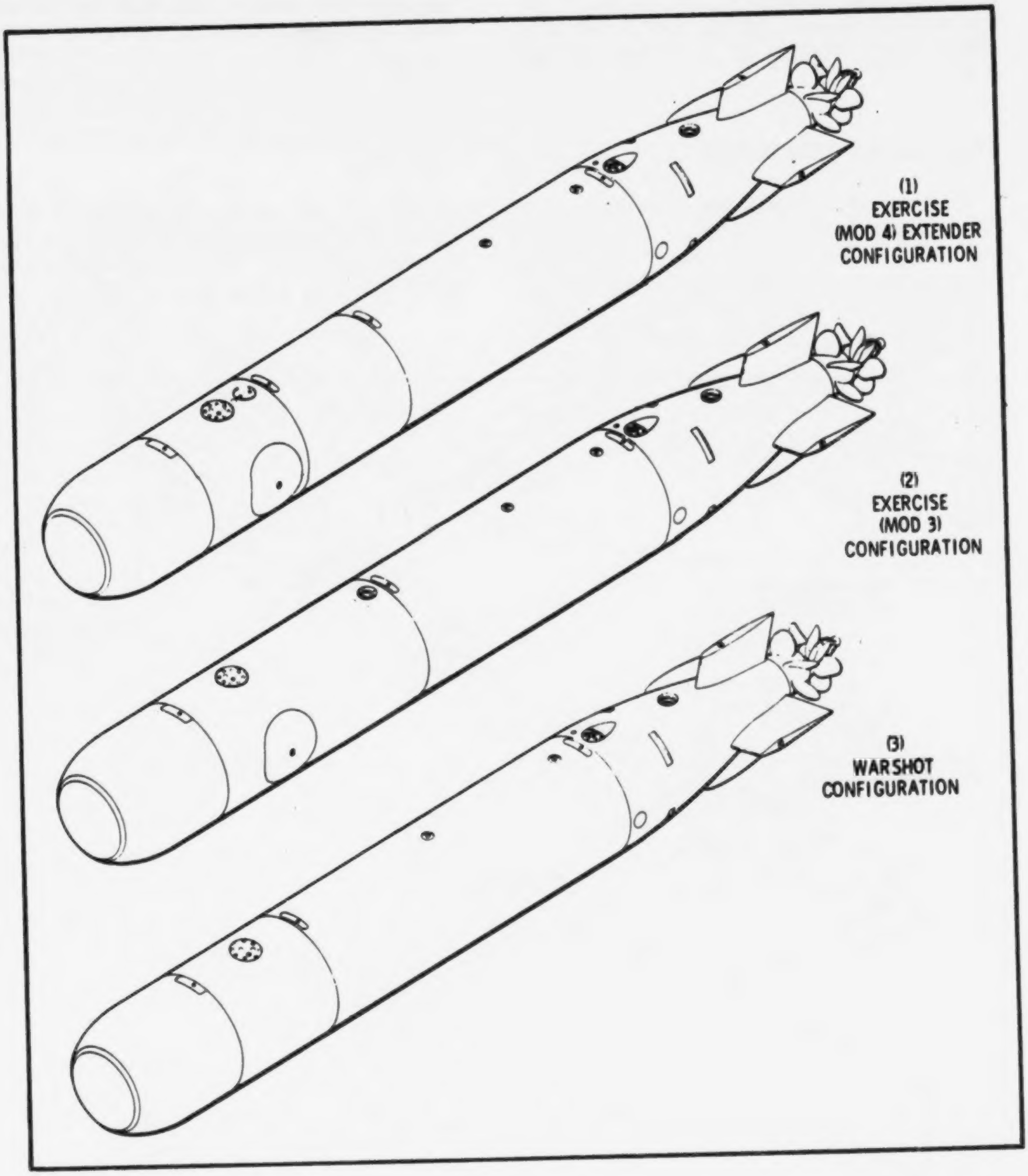
Mine laying is still an effective way to control shipping. Our mine warfare fleet has incorporated new technology and weapons to meet their objectives.

We are not going to discuss all of the torpedoes or mines still in use by the U.S. Navy, but we will give you a good overview of the Navy's most widely used weapons.


TAIL FIN
TURBOFAN ENGINE
STANDARD MISSION COVER
WING
REM NAMEPLATE (IF INSTALLED)
AUR SERIAL NUMBER (LOWER SLOT) PLATE
ROCKET MOTOR
PROPULSION SECTION
CONVENTIONAL WARHEAD
ANTI-SHIP GUIDANCE (MODIFIED HARPOON)
AFT BODY
MID BODY
PAYLOAD SECTION
RADOME
MISSILE
GUIDANCE SECTION
FORWARD BODY

63.92

Figure 6-12.—Tomahawk missile (antiship) configuration.


(1)
EXERCISE
(MOD 4) EXTENDER
CONFIGURATION
(2)
EXERCISE
(MOD 3)
CONFIGURATION
(3)
WARSHOT
CONFIGURATION

63.93

Figure 6-13.—Mk 46 Mod 5 torpedo.

Torpedoes

The U.S. Navy uses two torpedoes, the Mk 46 Mod 5 and the Mk 48 Mods 2, 3, and 4. A brief description follows:

- Mk 46 Mod 5—The Mk 46 Mod 5 torpedo (fig. 6-13) is a two-speed, deep-running, active or passive, acoustic-homing, antisubmarine warfare (ASW) weapon. Its mission is to search, detect, attack, and destroy enemy submarines. However, the torpedo can be assembled into exercise configurations that are used for training purposes. The torpedo can be launched from either a surface ship, a helicopter, or a fixed-wing aircraft.

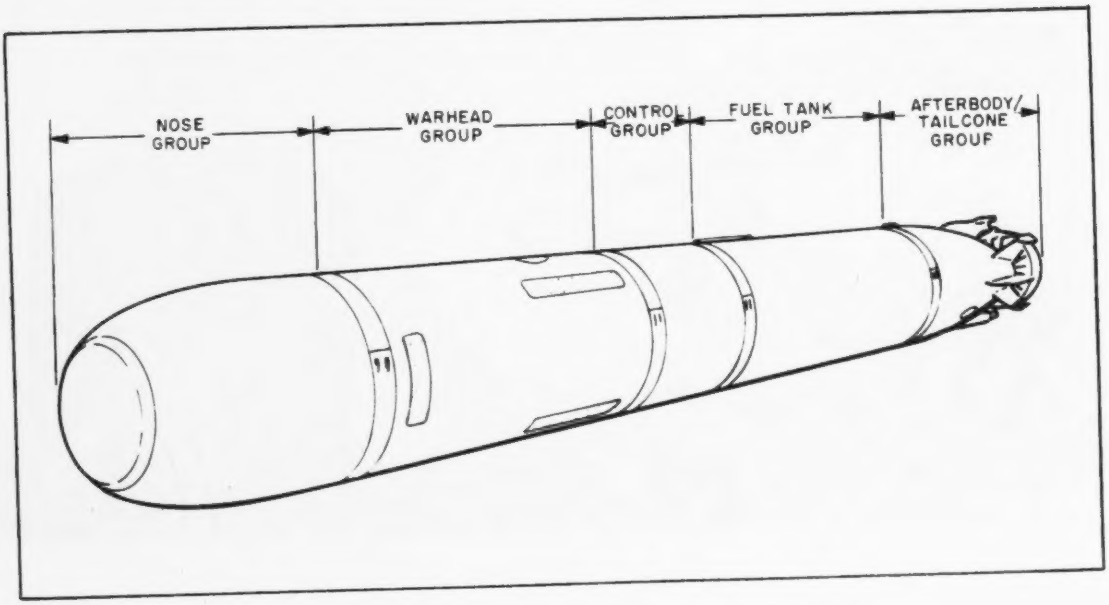
- Torpedo Mk 48—The Mk 48 torpedo (fig. 6-14) is a high-speed, deep-running, long-range, wire-guided, submarine-launched torpedo. It is used against other submarines and surface craft. This weapon has greatly enhanced the standoff range for the submarine force.

Mines

A mine is a thin-cased weapon that is filled with high explosives designed to explode under water when closely approached or struck by a ship (submarine or surface). There are mines that house torpedoes; however, we will not cover these mines. There are several types of mines in the fleet, which are all different from each other.

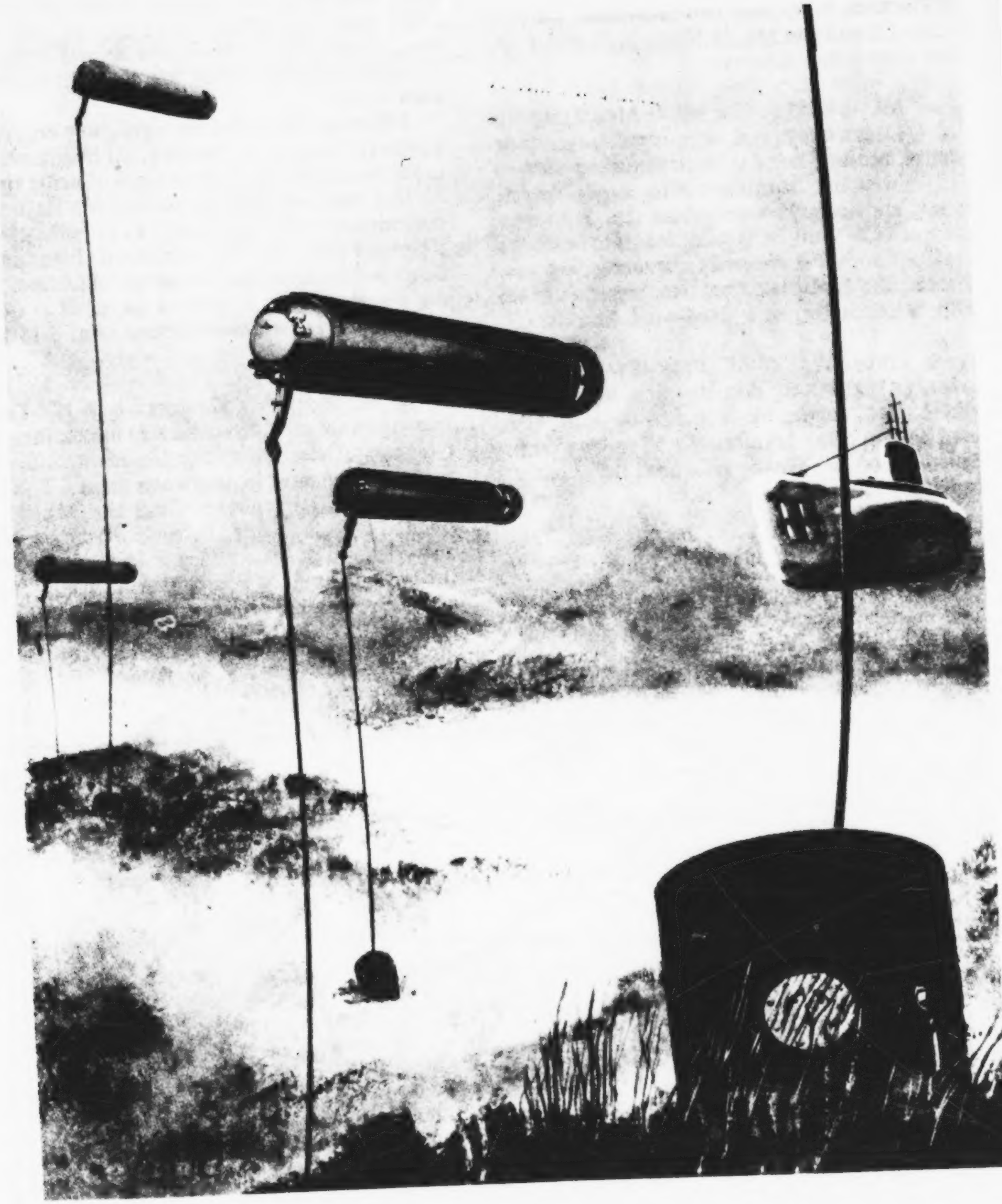
Mines are identified by types; they are typed by the (1) method of planting, (2) their position in the water, and (3) their method of being fired. At this time, we have no surface minelayers in commission, but if necessary, ships in the Naval Reserve Fleet could be reactivated. Planting of mines is done by either aircraft or submarine. For our purposes, we will refer to the mines as either *moored mines* or *bottom mines* (fig. 6-15 and 6-16).

- Mk 56 and Mk 57 mines (fig. 6-17). These two mines are considered moored mines; they use a magnetic detection system for detonation, and they can be planted in deep water depths. The Mk 56 is planted by aircraft and the Mk 57 is planted by submarine. Because of the security classification of these mines, information in this textbook is limited. For further information of a general nature refer to *Mineman 3 & 2*, NAVEDTRA 10166-D.



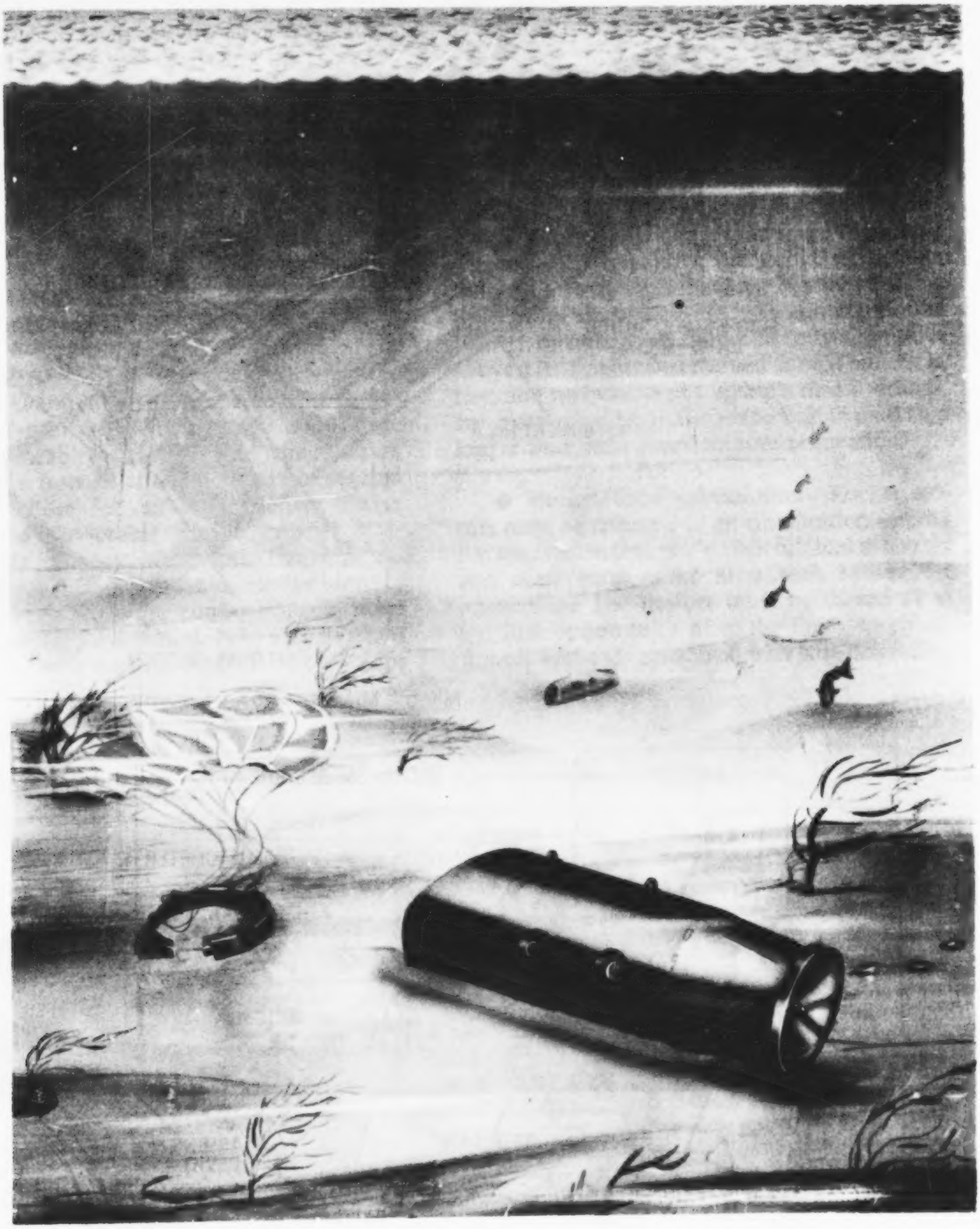
4.320

Figure 6-14.—Mk 48 torpedo.



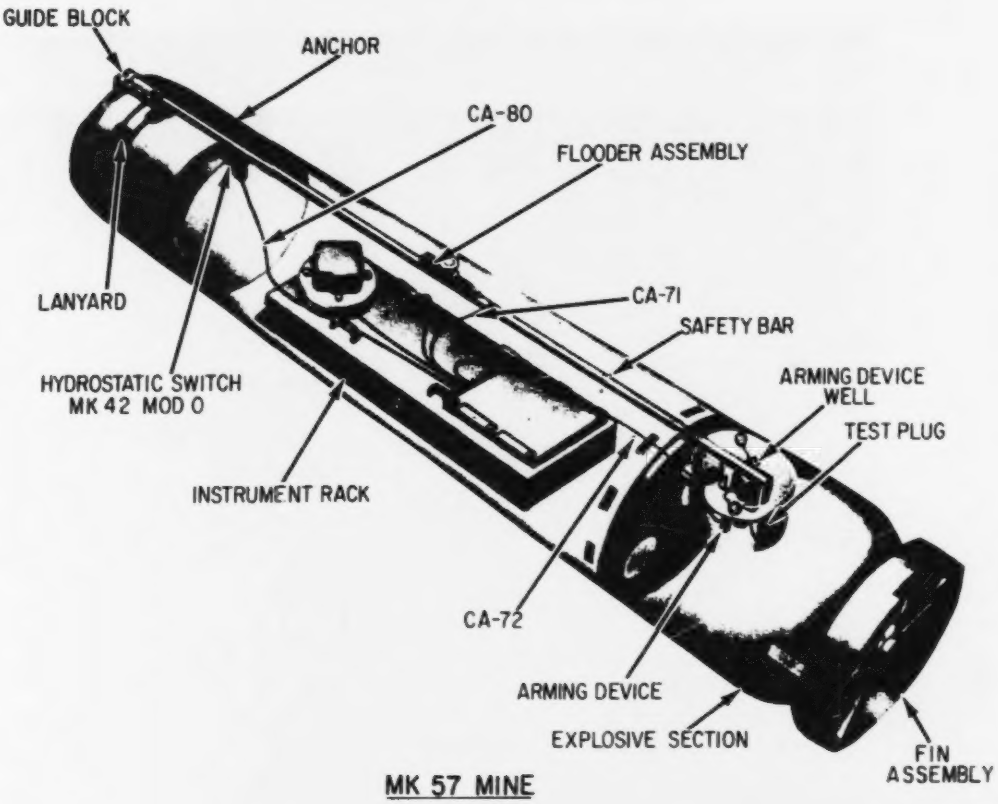
108.15

Figure 6-15.—Moored mine.

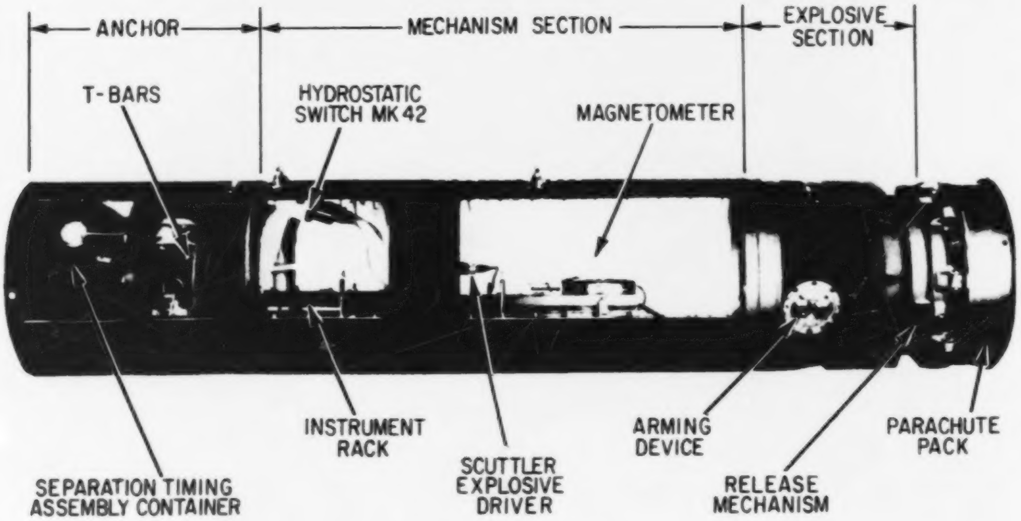


56.6

Figure 6-16.—Bottom mine.


GUIDE BLOCK
ANCHOR
CA-80
FLOODER ASSEMBLY
LANYARD
CA-71
SAFETY BAR
HYDROSTATIC SWITCH MK 42 MOD 0
ARMING DEVICE WELL
TEST PLUG
INSTRUMENT RACK
CA-72
ARMING DEVICE
EXPLOSIVE SECTION
FIN ASSEMBLY

MK 57 MINE


ANCHOR
MECHANISM SECTION
EXPLOSIVE SECTION
T-BARS
HYDROSTATIC SWITCH MK 42
MAGNETOMETER
INSTRUMENT RACK
SCUTTLER EXPLOSIVE DRIVER
ARMING DEVICE
PARACHUTE PACK
SEPARATION TIMING ASSEMBLY CONTAINER
RELEASE MECHANISM

MK 56 MINE

108.155:56.317

Figure 6-17.—Mk 56 and Mk 57 mines.

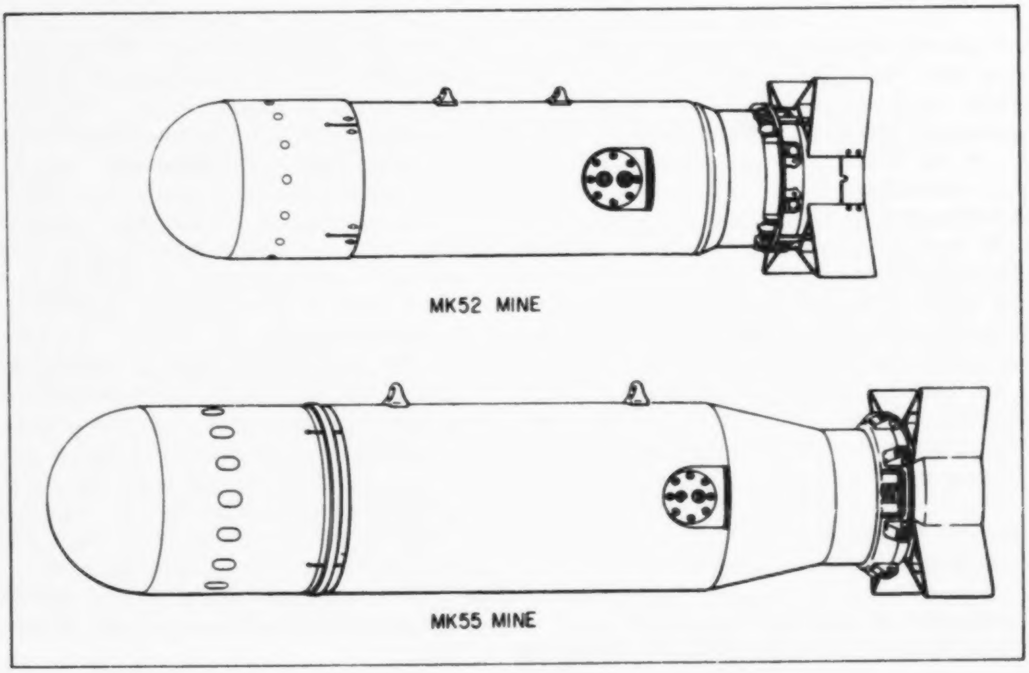
- Mk 52 and Mk 55 mines (fig. 6-18). The Mk 52 and Mk 55 mines are aircraft-planted, bottom mines and use the following types of influence firing systems: magnetic, acoustic, or a combination of magnetic, acoustic, and pressure. The major difference between these two mines is in their weight. The Mk 52 weighs 1,000 pounds and the Mk 55 weighs 2,000 pounds.

AMMUNITION AFLOAT (TIME LIMITATIONS)

NAVSEASYSCOM considers the normal return of ammunition during regularly scheduled yard overhauls will prevent the storage of unserviceable or dangerous ammunition afloat. The instructions issued to ammunition activities allow for an ample safety factor in assigned serviceable life to provide storage periods in excess of normal. The responsibility for issuing serviceable ammunition to the fleet rests with the commanding officers of the ammunition activities. NAVSEASYCOM requires that the commanding officers of ships stow ammunition only for prescribed periods of time as follows:

- Gun-Type Ammunition—All gun-type ammunition that has been aboard ship for five years after assembly or reassembly must be returned to an ammunition activity for examination, test, and renovation during the ship's next regular overhaul availability. In no case must this ammunition remain aboard ship longer than seven years after assembly or reassembly. All smokeless powder charges and cartridges that have been aboard ship three years since renovation at an ammunition activity or have been subjected to temperatures above 110 °F must be returned for examination, test, and renovation at the ship's next overhaul. In no case must such charges be kept aboard ship longer than four years without renovation.

- Rocket-Type Ammunition—Rocket motors must be returned to an ammunition activity for renovation five years after original assembly and every three years after each subsequent renovation. The motors must be turned in at the first opportunity after the times specified. Rocket warheads assembled with base detonating



63.94

Figure 6-18.—Mk 52 and Mk 55 mines.

fuzes must be turned in for renovation three years after loading or reassembly or two years after the last renovation inspection. Rocket warheads assembled with nose fuzes or auxiliary detonating fuzes must be turned in five years after loading or three years after renovation inspection. Rocket warheads with primacord ignition trains must be turned in five years after loading or two years after renovation inspection. The shorter age limit is applicable for warheads packaged with motors. All rocket fuzes and unserviceable inert components must be turned in at the same time as motors and warheads.

- Guided Missiles—Guided missiles must be returned as per NAVSEAINST 8815.1 or the Naval Airborne Weapon Maintenance Process Instruction (NAWMP).

- Bomb-type Ammunition—The shelf life of bomb-type ammunition is quite long and no turn-in cycle is presently in effect. Normal offloading of this ammunition during routine unit afloat overhaul availabilities will permit the ammunition activity to evaluate the condition of the items as to their serviceability.

AMMUNITION IDENTIFICATION

Ammunition items are most readily identified by size, shape, and weight. Specific characteristics of these items are further identified by painting, marking, lettering, or combinations of the three methods. Military Standard 709, *Ammunition Color Coding*, establishes standard colors to designate the primary hazard of the ammunition item. OP 2238, *Identification of Ammunition*, is intended to serve as a guide for the identification of Navy ammunition. The serviceability of ammunition is kept current by NAVSEASYSCOM through the use of notice of ammunition reclassification (NAR). In the next paragraphs, we will discuss NARs, ammunition lot numbering, and ammunition markings.

NOTICES OF AMMUNITION RECLASSIFICATION (NARs)

Ammunition may be reclassified as to its serviceability by NAVSEASYSCOM through the use of NARs. This reclassification, changing the expected service or shelf-life of an item, is a result of the various inputs from quality evaluations, firing reports, or mishap/incident reports. Reclassification of ammunition may require immediate disposal or turn-in of an item, suspension from use or limited use of the item. Whenever a reclassification of ammunition reduces ammunition quantities below authorized allowance, serviceable ammunition must be requisitioned and the unserviceable, suspended, or limited usage ammunition turned in to an ammunition activity. NAVSEA TWO24-AA-ORD-010 (formerly OD 17190), *Ammunition Unserviceable, Suspended and Limited Use*, is a compilation of NARs plus other useful data. The technical manual TWO24-AA-ORD-010 must be kept current to provide ordnance personnel with a good working reference. Additionally, an NAR file must be maintained until changes and revisions required by the NARs are incorporated into TWO24-AA-ORD-010. Shipments of unserviceable, obsolete, or restricted ammunition or explosives for disposition must be in the exact quantities in the order.

LOT NUMBERING FOR GUN AMMUNITION

In view of the large quantities of ammunition now being handled by shore activities and fleet units, a readily usable identification system has been established for gun-type ammunition to simplify recognition and reports. The system, in the form of an ammunition lot number, is lettered on each assembled complete round of component of gun or rocket ammunition.

The lot number system prior to 1978 consists of an ammunition lot number symbol (ALN) (a two- or three-letter prefix), a one- to four-part numerical group, a one- to three-letter group, a final numeral group, and sometimes a one- or two-letter suffix.

The prefix designation identifies the size and type of ammunition. A prefix designation having a final letter R denotes renovated items.

Following the prefix is a numerical group. This group indicates the sequential lot number of a particular type of ammunition item produced by an activity during the calendar year. This group consists of numbers 1 through 9999.

The next group of letters identifies the ordnance activity that assembled the ammunition item.

The final numerical group following the suffix group is the last two digits of the calendar year of assembly.

In summary, the lot number ALN-BER-245-HAW-80 is broken down to clarify the foregoing information.

1. ALN—Ammunition lot number symbol.
2. BER—BE identifies the ammunition as a 5"/38 AA common projectile. The R indicates a renovated ammunition lot.
3. 245—245th lot of AAC projectiles assembled.
4. HAW—Army Ammunition Depot Hawthorne, assembly activity.
5. 80—Assembled during 1980.

A letter is often noted following a lot number. Example: BER-5-GU-59A. The suffix indicates some type of screening or other work not requiring a rework lot number. The suffix does affect the status of a lot from a serviceability standpoint. For example: BER-5-GU-59 is listed in TWO24-AA-ORD-010 as unserviceable; this does not affect lot BER-5-GU-59A, which is a serviceable lot.

- Newly designed ammunition items are assigned a lot number MIL-STD-1168A DTD 28 February 1978. The following illustrates the construction of this new ammunition lot numbering system.

AMC	75	D	018	124	B
(a)	(b)	(c)	(d)	(e)	(f)

(a) manufacturer's identification symbol
(b) two-digit numeric code identifying year of production
(c) single alpha code signifying the month of production
(d) lot interfix number
(e) lot sequence number
(f) ammunition lot suffix

IDENTIFICATION OF AMMUNITION AND AMMUNITION MARKINGS

Distinguishing colors and markings are necessary to properly identify ammunition, ammunition components, and ammunition containers. *Identification of Ammunition*, OP 2238, serves as a guide for identifying by color, markings, and lettering all types of Navy gun ammunition, Navy rockets, projector charge ammunition, missiles, underwater ordnance, bombs, demolition material, and pyrotechnics.

Until recently, identification of ammunition was a rather difficult task. This difficulty arose from the existence of two color coding systems, identified as the Old system and the New system. Since ammunition under the Old system, for all practical purposes has been depleted, only the New or current system will be explained in the following text.

Color coding for 3-inch and larger gun projectiles may be applied as an overall body color, as appropriately colored bands over a nonsignificant background color, or a combination of body color, bands, and symbols.

The rotating band and the base of the projectile are not painted. Metal parts of a nose fuze are also unpainted; however, the fuze windshields may be nonmetal and have natural or protective coloring that is not significant within the meaning of the Ammunition Color Code. Drill projectiles with a dummy nose fuze are painted bronze color. Some specially manufactured dummy drill projectiles made of brass will be unpainted.

When the nonsignificant color, such as olive drab, is applied as an overall body color, painted bands are used for identification. The first band begins at the projectile nose or at the base of the nose fuze and extends toward the base of the projectile. The band width is equal to one-half the projectile diameter but does not exceed 3 inches. If a second color coding band is required, it is painted directly behind the lower edge of the first band. The second band width is one-fourth the diameter of the projectile but not over 1-1/2 inches wide. Projectiles are further marked to indicate characteristics such as the presence and the color of a tracer, a dye load, a color burst unit, or a chemical filler.

In addition to color bands, some projectiles are also marked with marking symbols for further identification. For example, the letters CCC indicate a color burst and are marked in the same color as the color burst item loaded in the projectile. The letters TTT denote a tracer and are marked the same color as the tracer.

The following is an example of these markings. An armor piercing (AP) or common high explosive with red tracer and yellow dye marker would be marked with an overall body color of olive drab. The nose of the projectile is painted black, denoting armor-defeating ammunition. The color band (only one) is painted yellow, indicating a high explosive. The letters TTT in red, immediately behind the yellow band, indicate a red tracer. The yellow letters DDD immediately behind the TTT letters indicate a yellow die marker.

In addition to the above markings, chemical projectiles are marked with the symbol for the chemical agent. For toxic or irritant agents, the symbol is marked in the same color as the bands denoting the type of agent. For a projectile containing a white phosphorus smoke filler, the symbol color is light red. The symbol is located on the ogive of the projectile just behind the nose fuze. The many and varied markings on projectiles preclude their being covered in this text. For more detailed information on color coding refer to OP 2238, *Identification of Ammunition*, and *WS18782A, Ammunition Color Codes*.

MAGAZINES

The detailed specifications for construction of the U.S. Navy ships and individual ship's blueprints developed and approved by NAVSEASYSCOM establish and designate ammunition stowage spaces for various ship types and classes and modifications. Where aircraft carriers or aircraft are involved, ammunition stowage spaces must also be satisfactory to NAVAIRSYSCOM.

Magazines are arranged with regard to facility of supply, the best obtainable protection, and the most favorable stowage conditions. Various types of explosives and ammunition are normally stowed in separate magazines or lockers so that the highest possible degree of safety is obtained. Stowages vary considerably with the type of ship, the space available, and the amounts of explosive involved. All magazines are marked by appropriate label plates designating the compartment and the types of ammunition to be stowed therein, for example, powder magazines and detonator lockers, and warnings applicable to specific special hazardous conditions and operations. Primary and missile magazines are designed to hold a ship's service allowance of ammunition. Ready-service magazines may be used to stow additional ammunition.

Changes in ammunition stowages made necessary by changes in types of ammunition or allowances or for any other reason must be referred to NAVSEASYSCOM for approval. No alterations to magazines must be made without approval from NAVSEASYSCOM.

Unsatisfactory stowage conditions and magazines that do not comply with applicable instructions must be reported to NAVSEASYSCOM with a request for instructions to correct the deficiencies.

AMMUNITION STORAGE REQUIREMENTS

The basic directive concerning ammunition storage in the fleet is OP 4, *Ammunition Afloat*. Chapter 3 of OP 4, covers spaces for ammunition aboard ship and regulations for shipboard storage of ammunition.

The instructions and regulations prescribed in OP 4 for issuing, receiving, handling, stowing, surveillance, maintenance, return of ammunition, and the preparation of reports are considered minimum criteria; therefore, reference to the specific weapon's ordnance pamphlet should be made for detailed requirements.

Instruction concerning the stowage and handling of mines, depth charges, torpedoes, and ammunition of a classified nature (nuclear weapons) are not covered in OP 4. These instructions are covered in separate publications.

The detailed specifications for construction of U.S. Navy ships and individual ship's blueprints, developed by Naval Ship Systems Command and approved by NAVSEASYSCOM, establish and designate ammunition stowage spaces for various ship types and classes and modifications. Where aircraft carriers or aircraft are involved, ammunition stowage spaces must also be satisfactory to NAVAIRSYSCOM. No alterations to magazines must be made without approval from NAVSEASYSCOM. Unsatisfactory storage conditions and magazines that do not comply with OP 3347 and other applicable instructions must be reported to NAVSEASYSCOM with a request for instructions.

MAGAZINE TYPES

There are many different types of magazines provided on ships. Each magazine is designated specifically for the type of ammunition it is to contain. The magazine types include primary, missile, ready-service, lockers, and biological and chemical. A description of each type follows:

- Primary magazines are stowage spaces that are generally located below decks and, if possible, below the water line. They are adequately equipped with thermal insulation, ventilation, and sprinkling systems, and they can be securely locked.

- Shipboard stowage requirements for guided missiles differ from the conventional ammunition magazine requirements. Usually the surface-launched missile magazines are located above the water line. The magazines for air-launched missiles on an aircraft carrier are located below the water line within the armor belt. Because of the danger involved, should a missile motor ignite while in the magazine, a plenum vent is provided for Tartar magazines, while Terrier magazines have relief ports. Restraining gear is provided for missile motors to prevent an inadvertently ignited missile motor from moving. Additional firefighting equipment is frequently provided for missile magazines. It may consist of carbon dioxide, foam, water injection, or a sprinkling system, or a combination of these systems.

- Ready-service magazines are designated spaces located near the weapon or area to be served and provide permanent stowage for part of the ammunition allowance. Included in the ready-service storage definition are such facilities as weather deck lockers, bulwark racks, and upper handling rooms. This stowage is used only when ammunition is actually required to service the weapon, and the amount so stowed should be kept to a minimum. Locking facilities for ready-service storage is not required if the primary magazines are adequate to stow the ready-service ammunition or when a watch is maintained at the guns and in the ready-service stowage areas. Certain of the missile magazines are designated ready-service magazines.

- Lockers and certain compartments are provided for stowage of special types of ammunition and ammunition components, such as detonators, pyrotechnics, and chemicals. They are frequently located on the weather decks and are as convenient to the weapon or space to be served as possible.

- Biological and chemical (B/C) magazines are specifically designated by NAVSEASYSCOM. Decks and bulkheads of these specifically designated magazines must be coated with an impermeable material. There must be provisions made to sample the air of such a magazine from outside the compartment itself. Facilities for personnel decontamination and gross decontamination must be provided near the magazine, as mentioned above. B/C ammunition of a lethal or incapacitating nature will not be carried aboard ship unless specifically authorized by NAVSEASYSCOM.

Primary, missile, and ready-service magazines are equipped with sprinkling systems. They are designed to handle a certain volume of water in a specified time. The time factor is related to the type of ammunition intended to be stowed in the magazines and how soon the ammunition would become unsafe under various heating situations. The reason that as many magazines as possible are located below the water line is to give added protection to the ammunition and to prevent loss of stability when flooded. Magazines will be flooded or sprinkled only when there is extreme danger of an ammunition fire and possible resulting explosion. If time is available, obtain the commanding officer's permission before flooding or sprinkling a magazine. In any circumstance, use sound judgment.

Shipboard magazines are designated with particular reference to the purpose intended. Insofar as practical, magazines are designed to hold a single type of ammunition. These are designated single-purpose magazines. While the storage of a single type of ammunition in individual magazines is desirable, it is not always possible. NAVSEASYSCOM has authorized certain mixed storages in magazines that nevertheless retain single-purpose designations. These mixed storages are outlined in OP 4.

Multipurpose magazines are designated where necessary because of space limitation. Where storage according to instructions is impossible, and where the mission requires carrying various types of ammunition, storage of more than one type in one magazine is is an acceptable hazard and authorization is at the discretion of the operational commander. Such mixed stowage does not include B/C weapons or pyrotechnics that have been removed from containers, or fuzes and detonators that are not integral parts of, or assembled within, the ammunition. For information concerning nuclear weapons check SWOP 20-7, *Transportation and Storage Safety for Atomic Weapons and Components* (U). Where mixed storage is necessary, precautions must be taken to ensure that the various types of ammunition are segregated within the magazine and that each type is suitably marked for identification. Storage charts must be maintained for those magazines that are used for mixed storage. These charts will show types, quantities, lot numbers, and other identifying data.

Insulation must be provided on bulkheads and decks of magazines located near a source of heat capable of providing temperatures of 110°F or more. Magazines on destroyers and small units normally are not insulated.

Magazine ventilation systems are provided to maintain temperatures below 100°F. The ventilation systems may be stopped to prevent overheating or condensation of moisture. The system should be secured when ventilation is not required to maintain the temperature below 100°F.

Storage of ammunition should be given considerable care so as to leave an air space around the stow to provide adequate ventilation to all parts of the magazine and throughout the stow.

Magazine maintenance is chiefly a matter of inspections, cleaning, occasional painting, sprinkler testing, and replacement of light bulbs, as required. Magazines are inspected daily; other magazine work should be scheduled on a routine basis. The better the daily routine that is scheduled, the less chance there is of magazine deterioration.

MAGAZINE SPRINKLING SYSTEMS

Sprinkling systems are used for emergency cooling of, and fire fighting in, magazines, ready-service rooms, ammunition and missile handling areas. The basic reference for sprinkling systems is NAVSEA 0348-LP-078-1000. This manual covers generally the description, operation, and test of the various systems in fleet use. Each ship, however, has a damage control manual that covers the ship's particular system. In general, all sprinkling systems consist of a network of pipes arranged around the overhead of the magazine and connected by a series of valves to the ship's salt water firemains.

The major difference between systems is the method of actuating (opening) the sprinkling control valve in the magazine. The systems vary in complexity. At one extreme is the simple piping arrangement in 5-inch handling rooms, where opening a single manually controlled valve will cause the ready-service racks to be drenched. At the other extreme is the automatically operated system used in the 5"/54 magazine. Here, heat-sensing devices are connected to pneumatically released pilot valves, which will trigger quick opening sprinkling valves and release a flow of water to strategically located spray nozzles.

For our purposes, we will divide the magazine sprinkling systems into four systems—the hydraulic, the wet, the dry, and the CO_2.

Hydraulic Systems

This type of sprinkler system (fig. 6-19) permits rapid actuation of the dry-type magazine sprinkling system. The control system uses MIL-L-15017 lubricating oil to operate and secure the system. This type of control system is no longer being installed aboard naval vessels, but it still can be found on some ships built prior to 1960.

A schematic drawing of one of the older sprinkling systems found in the fleet is shown in figure 6-19. The main control valve shown not connected in the system is a modified version of the valve connected in the system. Both valves, however, can be opened automatically by hydraulic pressure or manually by a ratchet wrench.

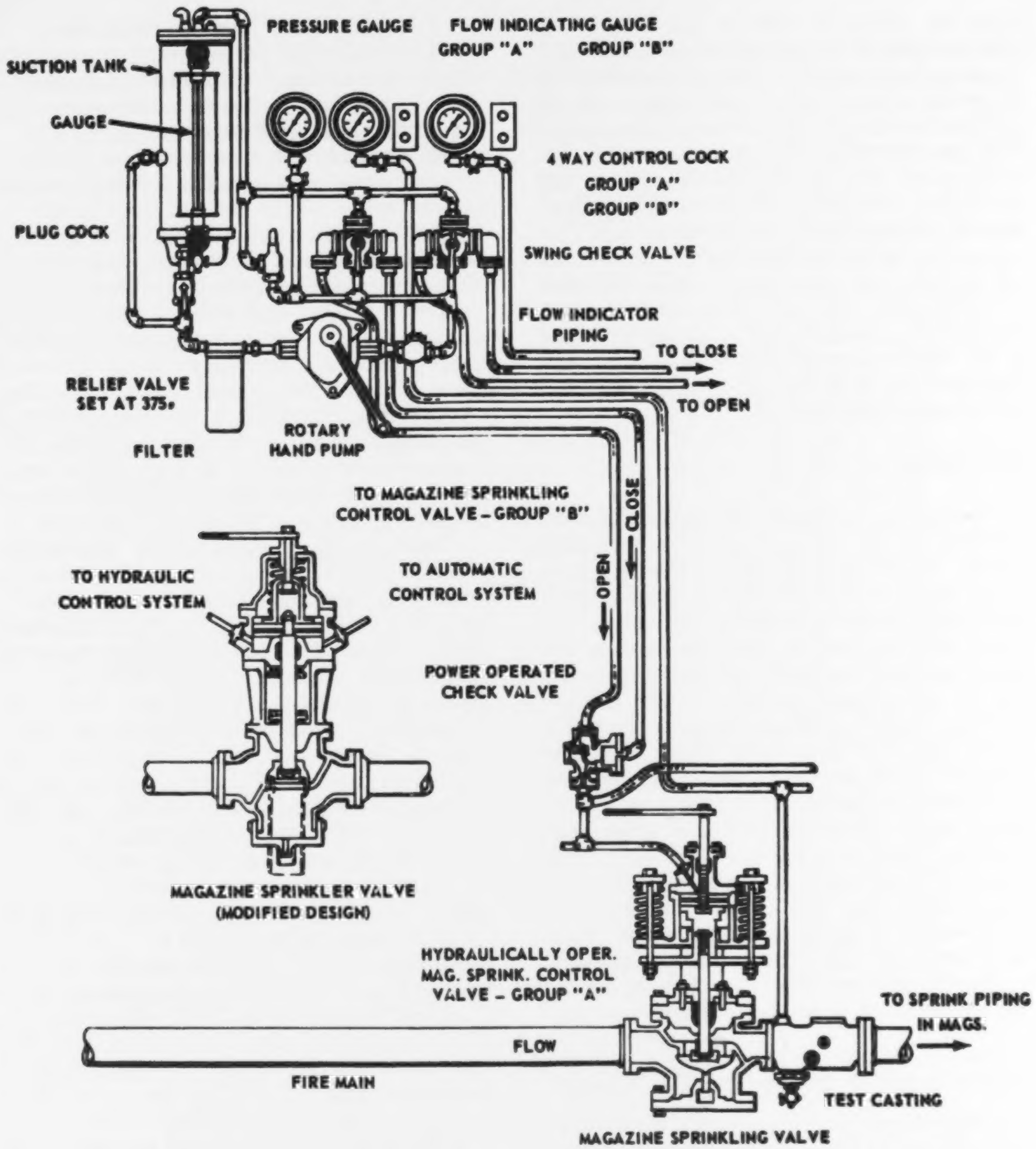
The hydraulic sprinkling system (main control valve) may be located in the handling room serving the respective magazine or group of magazines, in the passageway adjacent to the magazine, or in one of the magazines of the group served. The main control valve separates the water, under firemain pressure, from the dry, or magazine, side of the sprinkling system.

The main control valve, shown connected in the system (fig. 6-19) is opened by hydraulic oil pressure on top of the operating piston; this forces the valve disk down, allowing firemain water to pass through the valve into the sprinkler pipes. The main control valve shown not connected in the system (fig. 6-19), is opened by hydraulic oil pressure at the bottom of the operating piston, forcing the valve disk up to allow firemain water into the sprinkler pipes. Both valves, however, are held closed by spring pressure acting on the operating piston, and firemain pressure acting on the valve disk. If your magazines are divided in several groups, each group will have one of the types of control valves shown in figure 6-19. The control panel shown controls two groups, A and B, though only group A is shown.

The hand pump provides hydraulic force for opening the group main control valves. It is a rotary gear-type pump.

The four-way control valve (cock) selects the discharge of the hand pump to one of the following:

1. The oil cylinder of the control valve, opening it (OPEN position)
2. The power-operated check valve, permitting free return of oil from the control valve oil


PRESSURE GAUGE
FLOW INDICATING GAUGE
GROUP "A"
GROUP "B"
SUCTION TANK
GAUGE
4 WAY CONTROL COCK
GROUP "A"
GROUP "B"
PLUG COCK
SWING CHECK VALVE
FLOW INDICATOR
PIPING
TO CLOSE
TO OPEN
RELIEF VALVE
SET AT 375#
FILTER
ROTARY
HAND PUMP
TO MAGAZINE SPRINKLING
CONTROL VALVE - GROUP "B"
CLOSE
OPEN
TO HYDRAULIC
CONTROL SYSTEM
TO AUTOMATIC
CONTROL SYSTEM
POWER OPERATED
CHECK VALVE
MAGAZINE SPRINKLER VALVE
(MODIFIED DESIGN)
HYDRAULICALLY OPER.
MAG. SPRINK. CONTROL
VALVE - GROUP "A"
TO SPRINK PIPING
IN MAGS.
FLOW
FIRE MAIN
TEST CASTING
MAGAZINE SPRINKLING VALVE

11.331

Figure 6-19.—Hydraulically operated magazine sprinkling system.

cylinder, allowing the control valve to close (CLOSE position)

3. The return line, porting oil to the expansion tank (NEUTRAL position)

Hand-pump output from the one pump can be directed to either A or B control valves by the four-way control valves (cocks). Thus, if you want to sprinkle group A magazines and not group B, place the group A cock in the OPEN position and leave the group B cock in the NEUTRAL position, then turn the hand crank.

In an emergency, the main control valve can be opened by a ratchet wrench. After manually opening the valve, it takes two actions to close it. First, you must manually return the control valve screw spindle to its normal (CLOSE) position with the ratchet. Next, place the four-way cock in its CLOSE position; then turn the hand pump. This releases the hydraulic fluid in the control valve and allows the spring pressure to close the valve.

Information on the procedures for testing the foregoing sprinkling system may be found in the ship's General Information Book and Damage Control Book, and applicable maintenance requirement cards.

Wet Systems

The hydraulic control system permits rapid actuation of the wet-type magazine sprinkling system. The wet-type magazine sprinkling system is designed to sprinkle the protected space approximately one second after actuation. The rapid response time is obtained because the sprinkling system piping between the downstream side of the magazine sprinkling valve and the sprinkler heads is filled with fresh water, which is released as soon as the system is actuated. The fresh water is maintained under a gravity head provided by an accumulator tank located in a compartment above the protected space. The sprinkler heads are held closed by fresh water under 50 psig pressure from a pressurized accumulator tank that is also located in a compartment above the protected space. When the control system is actuated, the pressure holding the sprinkler head valves closed is released and the magazine sprinkling valve is opened.

NOTE: On some ships the pressurized freshwater tank may be located inside the magazine.

The hydraulic control system for the wet-type magazine sprinkling system has the following components (fig. 6-20, a foldout at the end of this chapter):

1. Control system piping
   a. Operating pressure circuit
   b. Actuating pressure circuit
   c. Freshwater charge circuit
   d. Pilot pressure circuit
2. Manual control valves
3. Remote control valve, hydraulically operated
4. Spring-loaded lift check valves
5. Hydraulically operated check valve
6. Orifices
7. Hydraulically operated control valve
8. Three-way hydraulic control valve
9. Sprinkler head valves
10. Gravity freshwater accumulator tank
11. Pressurized freshwater accumulator tank

The hydraulic control system uses seawater that is supplied from the firemain to actuate or secure the magazine sprinkling system

The magazine sprinkling system may be actuated from a local operating station located inside or immediately adjacent to the protected space, or from a remote operating station located on the damage control deck. One manual control valve is installed at the local operating station. The remote operating station manual control valve may be installed as a solitary valve or it may be installed in a bank at some central location.

The magazine sprinkling system is actuated by placing a manual control valve (local or remote) in the OPEN position. Seawater from the firemain then enters the OPEN loop of the operating pressure circuit. The operating pressure opens the hydraulically operated control valve and the three-way hydraulic control valve. When the hydraulically operated control valve opens, seawater from the firemain is admitted to the diaphragm chamber of the magazine sprinkling valve and to the inlet of the hydraulically operated check valve. The magazine sprinkling valve is opened by the actuating pressure acting against its diaphragm. When the three-way hydraulic control valve opens, the pilot pressure holding the sprinkler head valves closed is released and sprinkling commences. The opening of the magazine sprinkling valve and the initial sprinkling of the space are simultaneous actions.

The system is secured by placing a manual control valve in the CLOSE position. Seawater from the firemain then enters the CLOSE loop of the operating pressure circuit. The operating pressure closes the hydraulically operated check valve. When the remote control valve closes, the hydraulically operated control valve and the three-way hydraulic control valve are isolated from the operating pressure in the OPEN loop and are permitted to close. The closing of the hydraulically operated control valve isolates the diaphragm chamber of the magazine sprinkling valve from actuating pressure. The closing of the three-way hydraulic control valve results in pilot pressure being reapplied to close the sprinkler head valves. Simultaneously, the opening of the hydraulically operated check valve vents the actuating pressure from the diaphragm chamber of the magazine sprinkling valve, thereby allowing that valve to close completely.

The spring-loaded check valves permit operation from more than one operating station by preventing backflow through the other stations.

The orifices installed in the control system piping prevent a buildup of pressure caused by leakage past the manual control valves, the pneumatically released pilot valve (automatic control system component), or the hydraulically operated control valve. Additionally, they accelerate the operation of the control system by allowing the operating pressure to vent from the control system piping when the system is secured.

Dry Systems

This system uses seawater from the firemain for the operating pressure to actuate or secure the magazine sprinkling system (fig. 6-21). The

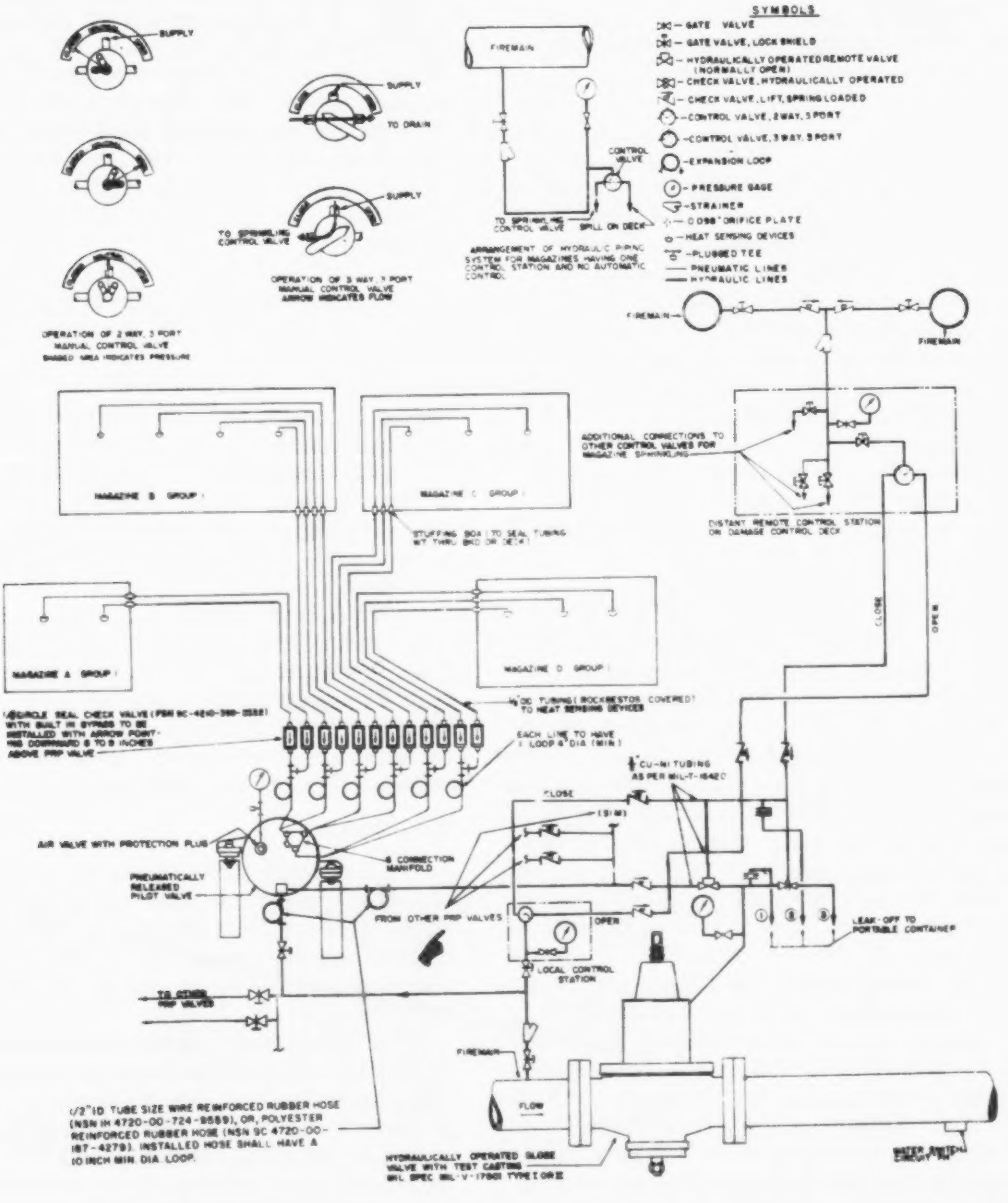

SUPPLY
SUPPLY
TO DRAIN
SUPPLY
TO SPRINKLING CONTROL VALVE
OPERATION OF 2 WAY, 3 PORT MANUAL CONTROL VALVE SHADED AREA INDICATES PRESSURE
OPERATION OF 3 WAY, 3 PORT MANUAL CONTROL VALVE ARROW INDICATES FLOW
FIREMAIN
CONTROL VALVE
TO SPRINKLING CONTROL VALVE
SPILL ON DECK
ARRANGEMENT OF HYDRAULIC PIPING SYSTEM FOR MAGAZINES HAVING ONE CONTROL STATION AND NO AUTOMATIC CONTROL
SYMBOLS
— GATE VALVE
— GATE VALVE, LOCK SHIELD
— HYDRAULICALLY OPERATED REMOTE VALVE (NORMALLY OPEN)
— CHECK VALVE, HYDRAULICALLY OPERATED
— CHECK VALVE, LIFT, SPRING LOADED
— CONTROL VALVE, 2 WAY, 3 PORT
— CONTROL VALVE, 3 WAY, 3 PORT
— EXPANSION LOOP
— PRESSURE GAGE
— STRAINER
— 0.098" ORIFICE PLATE
— HEAT SENSING DEVICES
— PLUGGED TEE
— PNEUMATIC LINES
— HYDRAULIC LINES
FIREMAIN
FIREMAIN
ADDITIONAL CONNECTIONS TO OTHER CONTROL VALVES FOR MAGAZINE SPRINKLING
DISTANT REMOTE CONTROL STATION ON DAMAGE CONTROL DECK
MAGAZINE B GROUP
MAGAZINE C GROUP
STUFFING BOX TO SEAL TUBING WT THRU BHD OR DECK
MAGAZINE A GROUP
MAGAZINE D GROUP
CLOSE
OPEN
1/8" OD TUBING (ROCKBESTOS COVERED) TO HEAT SENSING DEVICES
CIRCLE SEAL CHECK VALVE (FSN 9C-4810-390-2332) WITH BUILT IN BYPASS TO BE INSTALLED WITH ARROW POINTING DOWNWARD 8 TO 9 INCHES ABOVE PRP VALVE
EACH LINE TO HAVE 1 LOOP 4" DIA (MIN)
1/4" CU-NI TUBING AS PER MIL-T-16420
CLOSE
(SIM)
AIR VALVE WITH PROTECTION PLUG
6 CONNECTION MANIFOLD
PNEUMATICALLY RELEASED PILOT VALVE
FROM OTHER PRP VALVES
OPEN
LOCAL CONTROL STATION
①
②
③
LEAK-OFF TO PORTABLE CONTAINER
TO OTHER PRP VALVES
FIREMAIN
FLOW
1/2" ID TUBE SIZE WIRE REINFORCED RUBBER HOSE (NSN IH 4720-00-724-9589), OR, POLYESTER REINFORCED RUBBER HOSE (NSN 9C 4720-00-187-4279). INSTALLED HOSE SHALL HAVE A 10 INCH MIN. DIA. LOOP.
HYDRAULICALLY OPERATED GLOBE VALVE WITH TEST CASTING MIL SPEC MIL-V-17501 TYPE I OR II
WATER SWITCH CIRCUIT

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Figure 6-21.—Control system for dry-type magazine sprinkling system.

hydraulic control system has the following components.

1. Control system piping

NOTE:

> The term *operating pressure circuit* will be used to denote the control system piping.

2. Manual control valve
3. Remote control valve, hydraulically operated
4. Spring-loaded lift check valves
5. Hydraulically operated check valve

NOTE:

> The magazine sprinkling valve used in dry-type systems may be diaphragm operated or piston operated. The hydraulic control systems provided for these valves differ only in that a hydraulically operated check valve is normally provided for use with a diaphragm-operated magazine sprinkling valve. The hydraulically operated check valve is a diaphragm-operated valve and the hydraulically operated check valve is a piston-operated valve. The check valves perform identical functions.

7. Orifice—0.098 inch diameter flat plate orifices.

The magazine sprinkling system may be operated from a local operating station inside or immediately adjacent to the protected compartment, or from a remote operating station located on the damage control deck. One manual control valve is installed at the local operating station. The remote operating station manual control valve may be installed as a solitary valve or it may be installed in a bank at some central location.

The system is actuated by placing the manual control valve in the OPEN position. Seawater from the firemain (operating pressure) enters the OPEN loop of the operating pressure circuit; it then passes through the hydraulically operated remote control valve and enters the operating chamber of the magazine sprinkling valve and the inlet of the hydraulically operated check valve. The magazine sprinkling valve is opened by the pressure acting against its diaphragm or piston.

The system is secured by placing a manual control valve in the CLOSE position. Seawater from the firemain (operating pressure) enters the CLOSE loop of the operating pressure circuit and simultaneously closes the hydraulically operated remote control valve and opens the hydraulically operated check valve. When the system has been actuated and secured by the same manual control valve, the closing of the hydraulically operated remote control valve has no effect on the operation of the system. When the system has been secured by a manual control valve other than the one by which it was actuated, the closing of the hydraulically operated remote control valve isolates the magazine sprinkling valve and the hydraulically operated check valve from the operating pressure being transmitted via the manual control valve used for actuation. When the hydraulically operated check valve opens, the operating pressure is vented from the operating chamber of the magazine sprinkling valve, thereby permitting that valve to close rapidly and completely.

The spring-loaded lift check valves permit operation from more than one operating station by preventing backflow through the other stations.

The orifices prevent a build up of pressure in the control piping and subsequent opening of the magazine sprinkling valve in the event of leakage past a manual control valve. Additionally, the orifices permit the operating pressure to vent from the operating pressure circuit when the manual control valve is moved from the CLOSE to the NEUTRAL position.

A water alarm switch, circuit FH, is installed downstream from the magazine sprinkling valve. This switch actuates an alarm in damage control central when the system is operated or in the event of leakage past the magazine sprinkling valve. Maintenance of the water alarm switch is the responsibility of the engineering department.

CO_2 Systems

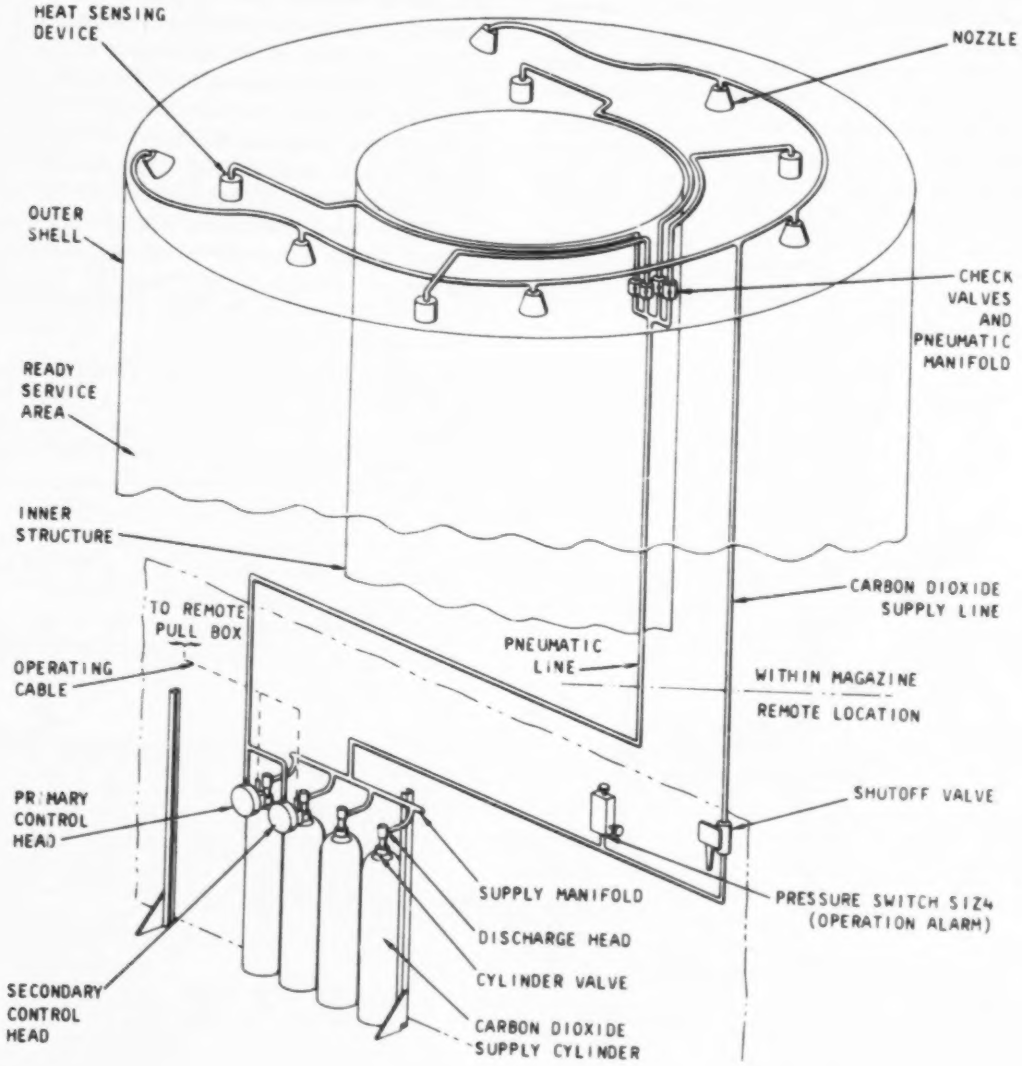
The primary components of the carbon dioxide systems are six heat-sensing devices, six supply cylinders, three pneumatic control heads, eight discharge nozzles, two shutoff valves, two operation alarm switches, and two remote control pull boxes.

The Tartar launching system magazine has an installed carbon dioxide system that is really two independent systems, one for the inner ring and another for the outer ring in the magazine. Each system automatically floods its area with carbon dioxide if its heat-sensing devices detect excessive temperatures. Each system can also be manually or remotely actuated.

The carbon dioxide supply cylinders (fig. 6-22) located below decks near the magazine structure contain liquid carbon dioxide at 850 psi at 70°F. The outer carbon dioxide system has four cylinders, and the inner carbon dioxide system has two cylinders. Each cylinder is equipped with a discharge head to which is connected supply hose that leads to a common manifold. In addition, two cylinders on the outer carbon dioxide system and one on the inner system have pneumatic control heads. Pneumatic lines connect the control heads to a pneumatic manifold. Pressure originating in one or more of the heat-sensing devices is transferred through the pneumatic manifold to the control heads.

The carbon dioxide system activates when pressure from one or more heat-sensing devices automatically trips a control head. The control heads trip the discharge heads on the control cylinders, and carbon dioxide flowing through the supply manifold trips the remaining discharge heads. This action releases the complete supply of carbon dioxide into the manifold.

Each system, inner and outer, may also be manually activated either locally or remotely. In local manual control, the safety locking pin on the pneumatic control head is removed


HEAT SENSING DEVICE
NOZZLE
OUTER SHELL
CHECK VALVES AND PNEUMATIC MANIFOLD
READY SERVICE AREA
INNER STRUCTURE
CARBON DIOXIDE SUPPLY LINE
TO REMOTE PULL BOX
PNEUMATIC LINE
OPERATING CABLE
WITHIN MAGAZINE
REMOTE LOCATION
PRIMARY CONTROL HEAD
SHUTOFF VALVE
SUPPLY MANIFOLD
PRESSURE SWITCH SIZ4 (OPERATION ALARM)
DISCHARGE HEAD
CYLINDER VALVE
SECONDARY CONTROL HEAD
CARBON DIOXIDE SUPPLY CYLINDER

83.116

Figure 6-22.—CO_2 system for the Mk 13 launching system.

and the emergency operating lever is rotated clockwise. This movement trips the actuating levers inside the control heads, and the supply cylinders discharge carbon dioxide as an automatic operation. In remote manual control, the pneumatic control heads are released by pulling the handle at the remote station. The pull box has a transparent breakable shield and a cable handle.

When carbon dioxide is released, it operates a pressure switch in the discharge line from the CO_2 manifold. Closing the switch shuts down the ventilating system, sounds an audible alarm, and lights up a visual alarm light to warn all personnel that the carbon dioxide system has been activated.

Testing and inspecting the carbon dioxide system for the Mk 13 launching system is covered in OP 2665, Volume 2. Information on the testing and inspecting of CO_2 systems found on other Tartar launching systems may be found in the OP for that system. Warnings and safety precautions pertaining to carbon dioxide systems are also found in the appropriate launching system OPs.

We have not covered all of the magazine sprinkler systems in use; for a particular system on your ship, refer to the appropriate OP or technical manual.

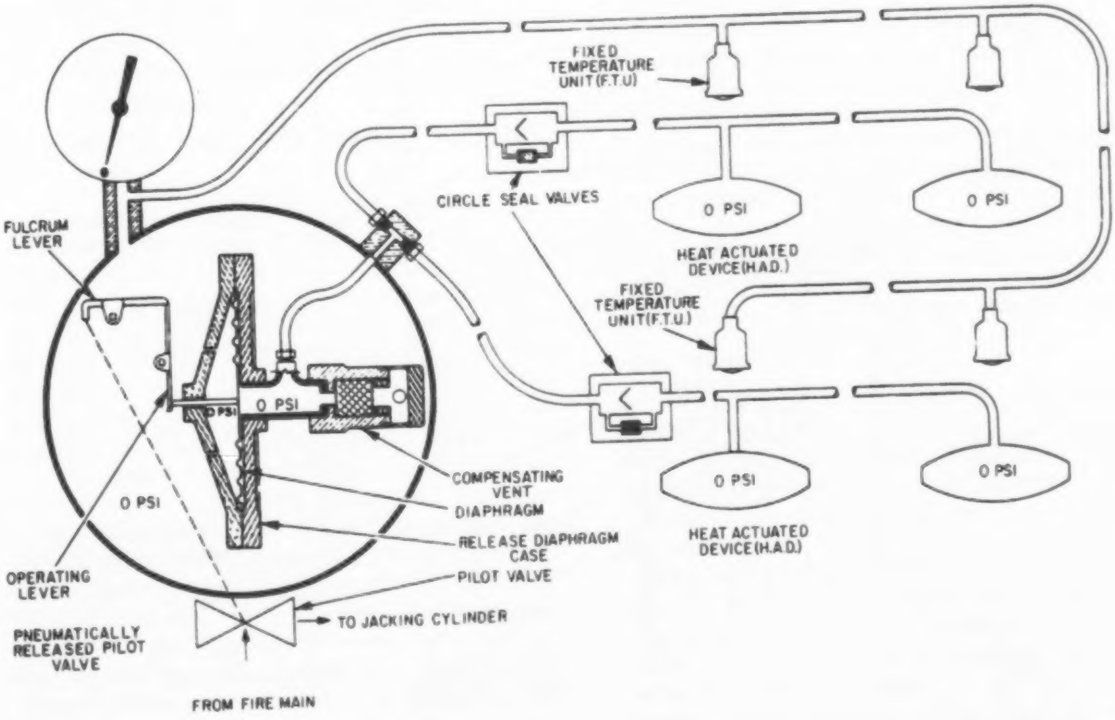
CONTROL DEVICES

Most magazine sprinkler systems are equipped with some type of automatic control device that is actuated by heat-sensing elements in the magazine area. These control devices actuate the same sprinkling system main control valve that is operated by the remote and local control stations. These devices are designed to actuate when a rapid rise in temperature occurs or when the heat exceeds a fixed temperature.

Pneumatic Release Pilot (PRP) Valve

Figure 6-23 is a schematic drawing of the automatic control system that is used in all missile and gun magazine sprinkling systems. The figure illustrates the use of the fixed temperature units (FTUs), the heat actuated devices (HADs), and the pneumatic release pilot (PRP) valve.

The PRP valve has a bronze case that encloses a release diaphragm, a chamber, linkage, springs, and a pilot valve shaft and lever that operate the pilot valve. The shafts and lever are connected to the PRP valve that opens and closes the main control valve. These parts are so arranged that movement of the diaphragm in the release diaphragm chamber, caused by a sudden increase


FIXED TEMPERATURE UNIT(F.T.U)
CIRCLE SEAL VALVES
O PSI
O PSI
HEAT ACTUATED DEVICE(H.A.D.)
FIXED TEMPERATURE UNIT(F.T.U)
FULCRUM LEVER
O PSI
O PSI
COMPENSATING VENT
DIAPHRAGM
RELEASE DIAPHRAGM CASE
PILOT VALVE
O PSI
O PSI
O PSI
HEAT ACTUATED DEVICE(H.A.D.)
OPERATING LEVER
TO JACKING CYLINDER
PNEUMATICALLY RELEASED PILOT VALVE
FROM FIRE MAIN

83.191.21(84B)

Figure 6-23.—Sprinkling system automatic control system, schematic.

of air pressure on the inside of the diaphragm chamber or sudden loss of air pressure on the outside, causes the pilot valve to trip open. One side of the release diaphragm case is open to the interior of the bronze pneumatically released pilot valve case. The other side of the release diaphragm is connected to the tubing from the compensating vent fitting and from the HADs.

Slow changes in air pressure between the inside and outside of the diaphragm chamber are equalized by a compensating vent. However, the vent cannot accommodate a rapid rise in air pressure, so the PRP valve will open under this condition. Opening of the PRP valve will admit firemain pressure to the sprinkling system main control valve to open it.

The PRP valve is a precision device, so repairs or adjustments to the valve are not to be attempted by ship's personnel. A metal tag is attached to the case by the manufacturer warning personnel not to open the casing for adjustment.

Testing of the PRP valve and pneumatic system is detailed in the instruction book, NAVSEA 0348-LP-078-1000, *Hydraulic and Automatic Thermo-Pneumatic Control Systems for Magazine Sprinkler System Control Valves.*

Fixed Temperature Unit (FTU)

The FTUs are designed to actuate the automatic control device (PRP) valve when the temperature in a protected area reaches a predetermined value.

The FTU shown in figure 6-24 consists of a spring-loaded cap that is held in place by indium solder. The solder is made from a material that will melt at a predetermined heat.

For an FTU to function the temperature rise must be slow, otherwise the HAD unit will actuate the PRP valve before the FTU can function. If the temperature rise is slow to a predetermined temperature, the solder seal holding the FTU cap under spring tension will melt. This will release the FTU cap and vent air pressure built up in the case of the PRP valve, causing the valve to trip.

Heat Sensing Device (HSD)

The latest control device for automatic sprinkling systems combines the features of both the rate of rise HAD and the FTU principle. The device, the heat sensing device (HSD), is used on many of the newest types of sprinkling systems (fig. 6-25).

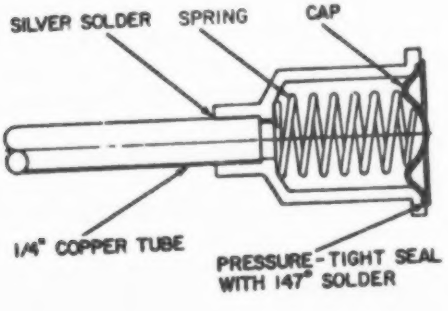


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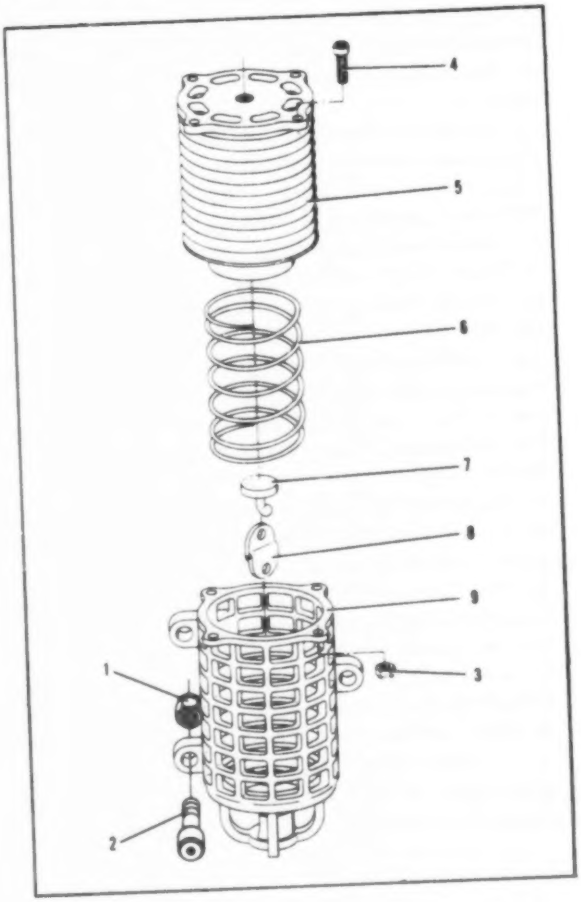
Figure 6-24.—Fixed temperature unit (FTU).



1. NUT, self-locking hex., 5/16-18
2. SCREW, sch cap, 5/16-18 by 1.0 in.
3. NUT, self-locking hex., no. 10-24
4. SCREW, cylindrical hd hex. skt. cap, no. 10-24 by 5/8 in.
5. BELLOWS ASSY
6. SPRING, compression
7. HOOK
8. LINK, fusible
9. HOUSING, heat sensing device

63.97

Figure 6-25.—Heat sensing device (HSD).

This device is a thin-walled, spring-loaded bellows containing air that is designed to create a pressure in response to either a rapid rise in temperature or a slow rise to 160°F.

The bellows are housed within a two-piece cylindrical cover that is latticed to permit contact between the bellows and the surrounding air. The bellows are held in an expanded position by a hook and fusible link that connects the end of the bellows and the fixed end of the cover. The design of the hook permits its end to be passed through a hole in the end of the fusible link during the assembly of the HSD. The fusible link is then fixed into the end of the housing, thereby preventing it from slipping. A spring, installed between the end of the bellows and the fixed end of the cover, exerts a constant force against the bellows.

HSDs are mounted on the overhead of the protected space. They are connected to the manifold by individual 1/8-inch O. D. transmission lines. A circle seal check valve is installed in each transmission line.

In the event of a fire resulting in a rapid rise in temperature in the protected space, heat is absorbed by the HSD. The heat is conducted to the air within the bellows causing it to expand and create pressure. This pressure is transmitted to the rear of the release diaphragm of the PRP, creating the differential pressure necessary to trip that valve.

In the event of a smoldering fire that results in a slow rise in temperature in the protected space, the pressure created within the bellows increases too slowly to trip the PRP. When the temperature reaches 160°F, the fusible link in the end of the collet melts, thereby removing the restraint holding the bellows. The bellows then collapses under the action of the spring. The sudden compression creates a pressure impulse that is transmitted to the rear of the release diaphragm of the PRP, thereby creating the differential pressure necessary to trip that valve.

LOGISTICS

In-port replenishment will require detailed planning and constant supervision. If you have planned the operation in detail, all that remains to do on loading day is make a few corrections where misunderstandings exist.

Before you begin to think about loading details in your advance planning, consult the senior officer present afloat (SOPA) instructions. These instructions prescribe the authorized ammunition transfer areas whether they are at anchorage or at a pier. You will soon learn that you can't just order ammunition to be delivered at pier. SOPA instructions deal mainly with safety considerations for a given area. Norfolk, Va., for example, will not allow any bomb-type ammunition to be handled simultaneously with gun-type ammunition. If you had not consulted SOPA instructions prior to planning, and were scheduled to load some bomb-type ammunition, this surely would have upset your loading plans.

These SOPA instructions can be amplified by a visit to the ammunition depot. Take along your ordnance gunner and/or Chief Gunner's Mate, as they are probably as well versed on ammunition as most depot employees. At the depot, you can ascertain any requirements that may not have been covered in the SOPA instructions. It may also be possible to receive your ammunition in an order that would be compatible with your storage plans. Pay particular attention even to seemingly inconsequential items, such as what time the civilians "knock off" for lunch or perhaps the authorized smoking spaces for the crew.

Now that we have the facts, it is possible to outline a workable loading plan. The *Ship's Organization and Regulations Manual* may include a standard loading plan. If not, you can most assuredly find a precedent in your weapons department's instructions and notices. This plan can be used as a guideline but will undoubtedly have to be altered to meet your present circumstances. Some of the questions to be considered are as follows:

1. How much ammunition is coming aboard (refer to ammunition invoices)?
2. Do we have the full crew on board?
3. How are we going to receive the ammunition (by barge/lighter, truck, boxcar, and so forth)?
4. Are we to receive a special type (such as missiles, ASROC) before we can proceed with the conventional gun ammunition?
5. Are there sufficient mechanical contrivances available?
6. What traffic routes should the ammunition handlers use?
7. What are the necessary safety prerequisites?

Your ammunition handling bill or loading plan should be issued in the form of a weapons department notice. Ensure that all persons in a supervisory capacity receive a copy of this notice. As an enclosure, you should include all personnel assignments by divisions. You will have to know how many personnel are available. Perhaps a meeting with the department heads prior to arming day will give you the necessary personnel figures as well as the names of those enlisted personnel who will be used as supervisors.

The importance of assigning qualified enlisted supervisors should be stressed. Normally, the supervisor will be a senior enlisted person who will be assigned to a station where the personnel in that division are working. This approach will soon prove its worth. For example, if you find it necessary to shift R division from carrying 5" projectiles for a mount 51 to helping out Fox division on the pier, your R division petty officer will see that the division gets there. Another advantage in this approach is the division's pride in working speedily and efficiently as a unit.

Now that our loading plan names the supervisors, and they in turn possess the names of their personnel, we can schedule a personnel indoctrination lecture.

The week before you receive the ammunition should be spent ensuring that all is ready in the magazines. Are they clean, painted, and otherwise ready? Are the storage plans posted? Have the sprinkling systems been checked and found to be operative? Do we have sound-powered communication for the personnel who will be stationed at the sprinkling control valves? Do all the ammunition hoists or elevators function properly?

There are many battens and stanchions used in magazines to support the ammunition. They are a constant headache to Gunner's Mates and often slow down the loading operation. It seems that these battens and stanchions will fit correctly only in their original slot. If they have been removed *en masse* for painting, without some system of identifying what goes where, you are in trouble. A simple and effective method of circumnavigating this problem would be to paint a number on the batten or stanchion, and a corresponding number on the slot in the magazine. MAKE SURE that these battens and stanchions fit correctly before the ammunition loading day.

Prior to taking the ammunition aboard ship, the ship's Gunner or Senior Gunner's Mate should compare the shipment with the invoiced quantities. A quality inspection should be conducted; any material that appears to be damaged or has been damaged in handling should be tagged and returned to the supplying activity.

After obtaining permission from the commanding officer, and ensuring that all conveyor belts, cargo nets, forklifts, wire cutters, and so forth, are ready, the weapons officer can commence the loading. These initial phases could be compared to a sputtering engine, but if you have planned well, the engine will soon come to life.

If you are loading at a depot and your ship is larger than a DD type, conveyor belts will probably be used to bring most of the conventional ammunition aboard. These belts, if properly used, are as fast as your handlers. Most of your conventional ammunition loading delay will come from striking the ammunition down into the magazines. Hoists are used for strikedown. Their speed is limited; they are usually slower than the crew. Some delay is also caused by the awkwardness in storing when the ammunition stack is approaching the overhead in the magazine.

You should circulate constantly during the loading. This will not only keep you abreast of the situation, but will inspire the crew as well. Try to make each station at least once every hour. Do not interfere with the operation except in an emergency. Iron out bottlenecks with your enlisted and officer supervisors who are assigned for that purpose.

Do you remember that "inconsequential item" we learned at the ammunition depot about what time the civilians knock off for lunch? We can now put that information to use. As we have said, our major loading delay seems to be in striking down the ammunition. This we found was caused by the slow operation of the hoists. As the noon hour approaches, why not increase the rate that we are bringing the ammunition aboard by stacking the overflow at the scuttles on deck? We could then feed our crew in shifts while the depot employees are eating. The result would be a continuous flow of ammunition to the magazines.

The loading of missile ammunition is quite different from conventional ammunition. Procedures covered here concern Terrier systems but also apply in some extent to Tartar. Missiles may arrive in railway cars or trucks, depending on the ammunition depot. The missiles are initially housed in coffinlike containers.

Depending on the missile system you have, the missile including the warhead is housed in one container, and the booster is in another similar container.

The loading procedures may vary with different types of missiles and different types of ships. Let's start with the crane on the pier. This crane is operated by depot personnel and is used to hoist the missile from the pier to the ship. This may be done with the missile still in the container. However, it may be somewhat faster to remove the missile from its container on the pier before hoisting it aboard.

The missile is hoisted aboard to the strikedown area. This area will vary from one type of ship to another.

There is a normally closed strikedown hatch in the strikedown area that is electrically operated by two elevator console panels connected in series. When both elevator console panels are activated, the elevator will rise to its upper limit, opening the strikedown hatch in the process. The elevator platform thus exposed is now ready to receive the missile, which is clamped tightly to the elevator to prevent damage in transit. Once again the elevator panels are activated and the elevator commences its descent into the missile house. When the elevator reaches the lowest position in its descent, the strikedown hatch will close. This is an added safety feature that prevents personnel from falling into the missile house. One of the elevator control panels is located in the missile house. The missile house control panel will control most of the internal strikedown operations.

It is necessary to connect the missile to its booster before storing the missile in a magazine rack. This is done in the missile house, and herein lies the time consumer in the missile loading operation. The missile and booster must be perfectly aligned before they can be joined together. Getting the missile and booster in position for mating consumes time. Sometimes this connecting process takes as long as 15 minutes.

An important design characteristic of some elevators that should not escape your attention is that when the elevator is in its descent and there is NO MISSILE ABOARD, the strikedown hatch will automatically close when the elevator passes its "stow" position. This stow position is considerably higher than the lowest position, so beware.

Spare warheads are no longer stowed onboard ships. Warheads will be connected to all the missiles that come aboard. If it becomes necessary to exchange a warhead with an exercise head on a missile, the warhead will be stowed in the empty exercise head container in the warhead magazine. Missiles with nuclear warheads are always stowed with the safing plugs installed.

Whether you are loading missiles or conventional ammunition, you must make full use of your key personnel. You should specifically outline in your loading plan the station and general responsibilities of these key personnel. The following assignments and responsibilities are suggested for a conventional destroyer loading at anchorage:

1. Officer of the deck
    a. Notify the commanding officer, weapons officer, or weapons department duty officer of the approach and departure of lighters (ammunition barges).
    b. Prior to loading ammunition, put out the smoking lamp—hoist BRAVO.
    c. Have the anchor light rigged and sentries posted on lighters during periods of darkness.
2. First lieutenant—This officer is your jack-of-all-trades and should be permitted to be flexible in his or her duties rather than being assigned to a specific station
3. Fire control or A/S officer—in charge forward
4. Second division officer—in charge aft
5. Senior Gunner's Mate
    a. Inventory the lighters prior to unloading and departure.
    b. Verify ammunition invoices.
    c. Designate storages in magazines—prepare records showing location of all ammunition by types and indices.
    d. Provide for the safe separate handling of detonators.
6. Fire control or A/S officer—in charge of boat and lighter parties.
7. Deck force personnel
    a. As directed by the weapons officer, take lighters and boats alongside the ship and spot them into position.
    b. Supervise the use of all cranes, booms, and winches.
8. Damage Controlmen
    a. Provide planking for protection of decks.
    b. Provide lumber to rig staging and chutes, when required.
    c. Inspect rigging and ensure that it is satisfactory.
    d. Provide shoring, dunnage, and so forth, for securing ammunition on the lighter as necessary.
    e. Provide fire hoses and fire axes as required.
9. Division officers and other junior officers—supervise own divisions.

UNDERWAY REPLENISHMENT

The primary aim of underway replenishment is the safe delivery of the maximum amount of cargo in a minimum of time. The operation must be accomplished without interfering with the primary mission of the support force.

Underway replenishment normally is accomplished by the use of various rigs connecting the replenishment ships and the supported units. In addition to the horizontal transfer method, helicopters are also used to augment the standard method.

Underway replenishment procedures differ somewhat from in-port replenishment procedures. For instance, we must consider the relatively short time our ship will be alongside the ammunition ship as compared to the time spent receiving ammunition in port. Because of the time element, the ammunition received at sea will be much less than in port.

Stringent demands are placed on the AOs and AOEs because of the number of ships they are assigned to supply. Therefore, the replenishment time alongside these ships is usually of short duration. To expedite replenishment, the task group will form in a replenishment formation and will go alongside in a predetermined order. A fairly slow speed and a smooth riding course will be selected by the officer in tactical command (OTC) to facilitate the ammunition transfer.

When ships are made up alongside and are traveling at reduced speeds, they are sitting ducks in the event of an attack. These tactical restrictions imposed on the task group will most certainly limit the AEs on station time during war. In peacetime, your ammunition rarely falls below the prescribed service allowance. You therefore "top off" in the allotted time.

Replenishment at Sea, NWP-38, presents the new standard tensioned replenishment alongside method (STREAM) that will be used to transfer missiles at sea. This is an automatic system that reduces handling to a minimum. ASROC will not, as a general rule, be transferred by this method but will be wire highlined. These techniques will be discussed in a later chapter.

You will have to devise an ammunition handling bill for use at sea. Its content should be similar to the in-port bill. Short, direct routes should be established from the receiving area to the magazine scuttles. Enlisted supervisors and officer safety observers should be assigned by name. You must remember in making up this at-sea ammunition handling bill that fewer personnel are required than when loading a full allowance of ammunition. As a matter of fact, it may be possible to accomplish this rearming entirely by the weapons department. This will give you tighter control and also follow the often violated safety precaution that decrees that excess personnel are a liability.

A rolling deck may cause the precipitate shifting of on-deck ammunition. Avoid accumulating ammunition on deck! If your ammunition handlers are not fast enough to keep the deck clear, slow down your receiving rate. If you are compelled to stack ammunition on deck, be sure that you have provided an ample supply of wedges, chocks, straps, preventers, and dunnage to be used in securing the ammunition. While it is nice to be fast, it is significant that rearming is never a competitive exercise with time as a criterion. Safety must always be uppermost in the minds of the ammunition handlers. Remember, ammunition is always dangerous when handled improperly or carelessly.

The transfer area is particularly dangerous for personnel. They should be cautioned to be constantly alert to any emergency. Lifelines must be removed to bring ammunition on board; therefore all persons engaged in line handling or otherwise involved with receiving the ammunition must wear lifejackets. You will probably have a Boatswain's Mate in charge at the transfer station. Having this responsibility, this person must ensure that thrummed mating has been placed on deck to absorb the shock of receiving each load and that the transfer rigging is safe and functioning properly.

One safety precaution for ammunition handling requires that firehoses be led out in the vicinity of ammunition routes, and that they be charged with water pressure to the nozzles. Attention should be given to the placement of these firehoses so that they do not interfere with the ammunition traffic routes. Quite often these charged hoses will leak at the connections and make the deck slippery. This is an even greater hazard in cold weather if the water on deck freezes.

REQUISITIONING PROCEDURES

The Military Standard Requisitioning and Issue Procedures (MILSTRIP) is used for ordering all nonnuclear ordnance. MILSTRIP requisitioning is based upon the use of a coded, single-line item document (DD Form 1348). It relies upon coded data for processing requisitions by automatic data processing equipment; therefore, *extreme care* must be taken by the requisitioner in selecting and assigning coded data elements.

When preparing a DD 1348, there are four publications that you should use for ammunition requisitioning, NAVSUP P-437, NAVSUP P-438, CINCLANTFLTINST 8010.4, and COMNAVLOGPACINST 8015.1.

You should be familiar enough with the MILSTRIP system to be able to correctly requisition or turn in ammunition and to understand supply status reports or the material ordered.

DD Form 1348

The following is an explanation of DD Form 1348, along with brief instructions for completing it. As you study this part, refer to the sample form in figure 6-26 to locate the blocks being explained.

BLOCK A—Enter the service designator code, unit identification code (UIC), and name of the activity to which the requisition will be submitted; for example, N00109 WPNSTA YORKTOWN VA.

BLOCK B—Enter the service designator code, UIC, and name of requisitioning activity; for example, V08943 UDT TWO ONE.

BLOCK C—Enter the noun name of the requested item; for example, grenade green smoke (optional entry).

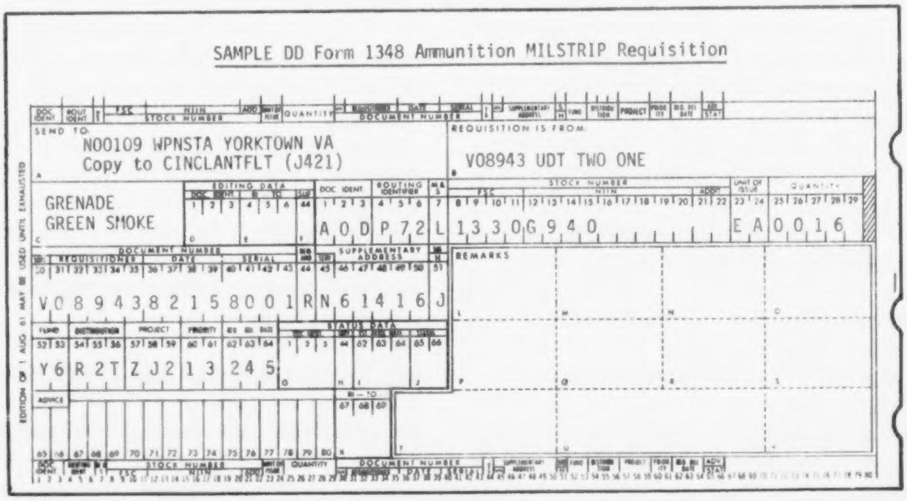
BLOCKS D, E, and F—Leave blank.

CARD COLUMNS 1 THROUGH 3—DOCUMENT IDENTIFIER: This is a three-digit code that identifies the basic type of administrative action; for example, AOD identifies the document as a requisition for overseas shipment.

CARD COLUMNS 4 THROUGH 6—ROUTING IDENTIFIER: This is a three-digit code that identifies the activity that is to receive the requisition; for example, P72 identifies WPNSTA YORKTOWN VA.

CARD COLUMN 7—MEDIA AND STATUS CODE: This is a one-digit code to indicate the type of status to be furnished; for example, digit 3 means exception status to the requisitioner by mail. Exception status consists of information relative to any action taken by the supply source other than issue of the material; for example, requisition is rejected; requisition is referred to another activity for action; substitute item is furnished, and so forth. Normally, enter 3 in block 3.

CARD COLUMNS 8 THROUGH 22—STOCK NUMBER: This is a 15-digit space available for national stock numbers. It is


SAMPLE DD Form 1348 Ammunition MILSTRIP Requisition

SEND TO
N00109 WPNSTA YORKTOWN VA
Copy to CINCLANTFLT (J421)

REQUISITION IS FROM
V08943 UDT TWO ONE

GRENADE
GREEN SMOKE

DOC IDENT: A O D
ROUTING IDENTIFIER: P 7 2
M & S: L
STOCK NUMBER: 1 3 3 0 G 9 4 0
UNIT OF ISSUE: E A
QUANTITY: 0 0 1 6

DOCUMENT NUMBER: V 0 8 9 4 3 8 2 1 5 8 0 0 1 R
SUPPLEMENTARY ADDRESS: N 6 1 4 1 6
J

FUND: Y 6
DISTRIBUTION: R 2 T
PROJECT: Z J 2
PRIORITY: 1 3
REQ DEL DATE: 2 4 5

REMARKS

EDITION OF 1 AUG 61 MAY BE USED UNTIL EXHAUSTED

43.24

Figure 6-26.—Sample ammunition requisition (DD Form 1348).

permissible (and normally desired) when requisitioning ammunition to enter the DOD ammunition code instead of the national stock number. Enter the DOD code for the item requested; for example, 1330G940 identifies grenade green smoke.

CARD COLUMNS 23 AND 24—UNIT OF ISSUE: Enter the two-digit abbreviation for the UIC of the item being requisitioned, as indicated in NAVSEA OD 12067; for example, EA, RD.

CARD COLUMNS 25 THROUGH 29—QUANTITY: Enter the quantity required, with zeros in unused columns preceding the quantity required; for example, 00016. If the quantity exceeds 99,999, additional requisitions must be submitted for the remainder.

CARD COLUMN 30—SERVICE CODE: For example, V, Atlantic Fleet operating ships or R, for Pacific Fleet operating ships.

CARD COLUMNS 31 THROUGH 35—REQUISITIONER: Enter the UIC of the requisitioner.

CARD COLUMNS 36 THROUGH 39—DATE: Enter the four digits representing the Julian date on which the requisition is transmitted to the supply source. The Julian date consists of two elements—the last digit of the calendar year and the numeric consecutive date of the calendar year; for example, 9181 represents 30 June 1979. The numeric consecutive day of the year may be found on government issue calendar pads.

CARD COLUMNS 40 THROUGH 43—SERIAL: Enter a four-position serial number. Automated ships should use 5000 series serial numbers; nonautomated ships should use 8000 series serial numbers. Requisition serial numbers will not be duplicated on the same day.

CARD COLUMN 44—DEMAND: The demand code indicates whether the demand is recurring or nonrecurring. Use demand code R (recurring) when the item requisitioned is for shipfill, mission load, or cargo load allowance; use N (nonrecurring) when the item requisitioned is clearly a one-time request.

CARD COLUMNS 45 THROUGH 50—SUPPLEMENTARY ADDRESS: Fleet units should use this field to indicate where the material requisitioned is to be received and loaded by entering the service code and UIC of the loading activity; for example, N61416.

CARD COLUMN 51—SIGNAL: The signal code is used to identify the activity to which material is to be shipped and/or billed; for example, J.

CARD COLUMNS 52 AND 53—FUND CODE: The fund code is a two-character code that is used to cite accounting data on Navy requisitions; for example, fleet units enter fund code Y6.

CARD COLUMNS 54 THROUGH 56—DISTRIBUTION: Distribution field entries serve a dual purpose and are mandatory entries. The first position indicates the monitoring activity and the other two positions indicate the cognizance (COG) symbol of the material being ordered. In card columns 54 through 56 enter the applicable COG symbol of the material being ordered; for example, R2T.

CARD COLUMNS 57 THROUGH 59—PROJECT CODE: This code is a mandatory entry used to identify the purpose for which the item requisitioned is to be used; for example, ZJ2.

CARD COLUMNS 60 AND 61—PRIORITY: Priority is a mandatory entry that expresses the relationship between the requisitioner assigned force/activity designator and the selected urgency of need designator; for example, 13.

CARD COLUMNS 62 THROUGH 64—REQUIRED DELIVERY DATE: This is a mandatory entry. Enter the specific three-digit Julian date; for example, 245.

CARD COLUMNS 65 AND 66—ADVICE CODE: This code is optional; it is used to provide the supply source with special instructions.

DATA BLOCKS L THROUGH V—REMARKS: Normally, requisitions will not contain remarks.

Requisitioning Ammunition by Naval Message

When time is a factor, requisitions may be transmitted by naval message, telephone, or radio.

Naval message requisitions will be prepared using the following guidelines:

1. The message will be sent to the supply source indicated in the routing identifier—block 2 of the MILSTRIP. Information copies will be provided to COMNAVLOGPAC or CINCLANTFLT and the activity where the material is to be delivered.

2. The message will be unclassified and the standard subject identification code (SSIC) will be N08012 for CINCLANTFLT.

3. The subject will be ammunition MILSTRIP requisition.

4. Sample message:

AOE/N24/6/14101911/EA/00001/V04690/8126/8025/R/N62688/J/Y6/R8T/ZJ2/13/250/2T

Following is a breakdown of the above message and the identification of each part. AOE, document identifier; N24, routing identifier; 6, media and status code; 14101911, DOD ammunition code or NSN; EA, unit of issue; 00001, quantity; V04690, service designator and UIC; 8126, Julian date; 8025, serial; R, demand code; N62688, loadout activity; J, signal code; Y6, fund code; R8T, distribution code; ZJ2, project code; 13, priority; 250, required delivery date; and 2T, advice code.

Requisitions transmitted verbally by telephone or radio must be relayed in exactly this same coded format. Normally, written confirmation of these verbal requisitions is not required.

The answers to any further questions you may have on MILSTRIP in regard to requisitioning ammunition can be found in volume II of the NAVSUP manual, NAVSUP publications 437 and 485.

ALLOWANCES

The NAVSEASYSCOM ensures promulgation of the allowances of ammunition established by the Chief of Naval Operations (CNO). This is accomplished by using NAVSEA ammunition allowance lists (30000 series) and NAVSEA instructions, which establish the full allowances. The source of supply for the NAVSEA ammunition allowance lists is the Navy Ships Parts Control Center (SPCC Code 730), Mechanicsburg, Pennsylvania.

Generally speaking, there are two ammunition allowances for each ship. One is the shipfill allowance that is required for combat readiness; the other is that portion of the full load that is expended yearly in training.

A NAVSEA shipfill ammunition allowance list in the 30000 series is issued to each vessel in active service listing the full wartime allowance of ammunition that is authorized in that particular ship. Another NAVSEA ammunition allowance list, also in the 30000 series, is issued to certain ships, such as aircraft carriers, ammunition ships, and others listing the prescribed types and amounts of ammunition that that ship is required to carry as a mission load/cargo load. This is to be carried in addition to the regular service allowance.

Cognizant fleet, force, and type commanders may authorize temporary deviations from these allowances whenever it is necessary to meet scheduled or anticipated operations. However, requests for major revisions of NAVSEA ammunition allowance lists should be directed to the CNO, via the appropriate chain of command and NAVSEASYSCOM Headquarters. Requests for minor changes or substitutions of types should be forwarded directly to NAVSEASYSCOM.

Each shipfill allowance list prepared for new construction or revised for major conversion/regular overhaul will be issued as an interim list. This list is limited to shipfill lists and requires fleet validation. When each list is validated by the fleet, or within 6 months' maximum time, it is replaced with a finalized allowance list bearing a new revision letter and date.

The training ammunition allowances for all phases of active fleet training as established by the CNO are promulgated in the NAVSEAINST 8011 series. These instructions set forth the various training allowances for each year and remain in effect until modified or canceled. Allowances as prescribed are for the purposes and periods as specified only. Any unexpended allowance at the termination of a specific cruise or fiscal year, as appropriate, is automatically canceled.

Should an augmentation of the allowance of a specific type, or types, of training ammunition be desired, a request may be made to the cognizant fleet or type commander. Requests for special allowances and requests for permanent modifications of training allowances should be addressed to the CNO via the appropriate chain of command and NAVSEASYSCOM.

Ammunition allowances, both service and training, constitute the necessary authority for the requesting of ammunition from ammunition facilities. Care must be taken to ensure that all requested ammunition conforms with space, weight, stability, and immersion limits prescribed by NAVSEASYSCOM and the limiting weight of ammunition as specified in the ship's ordnance equipment list. Also, the cumulative total of training ammunition requested must not exceed the annual allowance.

Return of Ammunition

When it is necessary to turn in ammunition, a DOD Single-Line Item Release/Receipt Document, DD Form 1348-1 (fig. 6-26) must be prepared for each type of ammunition.

Ammunition details are also turned in by using the same procedures as above. For detailed instructions, consult CINCLANTCSTINST 8010-4G and COMNAVLOGPACINST 8015.1B.

Duties of the Armorer

The duties of the armorer are varied and many. One of the most important responsibilities is the custody, maintenance, and inventory of all small arms. An equally important responsibility is ensuring that the magazines are inspected daily. The armorer receives the magazine temperature reports and presents the results to the commanding officer via the weapons officer and the officer of the deck. On some ships, the magazines are inspected by other designated Gunners's Mates, but this is normally considered the armorer's responsibility.

The keys to the magazines are kept in the custody of the commanding officer. The magazine locks are series locks, and master keys are provided that will open any of the locks.

These keys are drawn from the commanding officer each morning in preparation for the day's work. They are turned in by the armorer at the end of the working day. Monthly tests of magazine sprinkling systems may be accomplished by the armorer, but must be witnessed by a commissioned officer or a senior petty officer (E-6 through E-9). The armorer is also required to issue and control all small arms, nightsticks, whistles, brassards, and so forth, that the ship's sentries, guard mail POs, and shore patrol require to perform their duties.

Because of the highly pilferable nature of firearms and the danger in their use by unskilled and/or unprincipled persons, strict measures must be taken by all ships and stations to ensure maximum security for firearms in their custody. Safeguards against loss or theft of firearms must be established following OPNAVINST 5530.13, or as directed by the ship or station commanding officer's directive.

Vulnerability to pilferage makes it mandatory to keep a system of custody records of all firearms aboard a ship or station. Firearms in armories or other storage locations must be stored under conditions of maximum security. The inventory of firearms should be covered by a commanding officer's directive, with inventories to be taken at least during the following times:

1. Each month with a 100 percent physical count; quarterly with 100 percent physical inventory by serial number
2. Upon commissioning or inactivation
3. Upon relief of the department head responsible for firearms
4. Upon relief of the commanding officer
5. Upon relief of the armory custodian

Firearms issued to individuals should be signed for by the individual, and should be included in any inventory taken as prescribed by the commanding officer's directive. In order that such identification is readily available in the event of loss or theft, inventory records should include all the firearm identification data.

When not in use, firearms must be secured in an armory-designated locker or personal safe. When not issued for use, pistols and revolvers must be secured in a suitable locker. Rifles, shotguns, and machine guns should be secured by a chain or cable running through the trigger guards or receiver openings and padlocked to the storage lockers or racks. The lockers and/or racks must be located in a room that can be secured by padlock or combination lock of a type approved for storage of classified material.

Sensitive Ammunition Control

The increasing reported instances of ammunition and weapon pilferage by dissident groups and individuals indicates the necessity for strict control of storage security, custodial responsibility, and inventory reconciliation procedures for sensitive ammunition items. Sensitive ammunition items include, in general, any easily pilferaged items that can be concealed and carried away by individuals. Primarily, these are items capable of direct use, such as small arms ammunition, grenades, blasting caps, and demolition blocks. It is incumbent on activities drawing ammunition against allowances herein to do the following:

1. Provide authorized and secure storage prior to ultimate expenditure to preclude pilferage. Any discrepancies in physical inventory are to be reported to the appropriate authorities.

2. Immediately reconcile discrepancies between quantities reported as shipped and actually received to determine if they are lost or stolen in transit. Irreconcilable quantities must be immediately reported.

3. Ensure that quantities issued for training be made only to responsible individuals. These persons will be held accountable to ensure that all items are used in training or turned in if not expended. A system of signed receipts should be established at the user level.

REFERENCE LIST

Afloat Supply Procedures, NAVSUP P485, Naval Supply Systems Command, Washington, D.C., January 1984.

Ammunition Afloat, NAVSEA OP 4, Naval Sea Systems Command, Washington, D.C., October 1983.

Ammunition and Explosives Ashore, NAVSEA OP 5, Volumes 1 and 2, Naval Sea Systems Command, Washington, D.C., November 1982.

Demolition Material, NAVSEA OP 2212, Naval Sea Systems Command, Washington, D.C., January 1978.

Department of the Navy Information Security Program Regulations, OPNAVINST 5510.1F, Office of the Chief of Naval Operations, Washington, D.C., September 1978.

Electromagnetic Radiation Hazards (Hazards to Personnel, Fuel and other Flammable Materials), NAVSEA OP 3565, Naval Sea Systems Command, Washington, D.C., November 1979.

Identification of Ammunition, NAVSEA OP 2238, Naval Sea Systems Command, Washington, D.C., January 1971.

Magazine Sprinkler Systems, NAVSEA 0348-LP-078-1000, Naval Sea Systems Command, Washington, D.C., September 1971.

Mk 46 Mod 5 Torpedo, NAVSEA SW515-A5-MMI-010, Naval Sea Systems Command, Washington, D.C., September 1981.

Navy Gun Ammunition, NAVSEA SWO30-AA-MMO-010, Naval Sea Systems Command, Washington, D.C., April 1981.

Navy Nuclear Weapon Security Manual, OPNAVINST C5510.83E, Office of the Chief of Naval Operations, Washington, D.C., July 1982.

Ordnance Safety Precautions, Their Origins and Necessities, NAVSEA OP 1014, Naval Sea Systems Command, Washington, D.C., August 1972.

Physical Security Instructions for Sensitive Conventional Arms, Ammunition and Explosives, OPNAVINST 5530.13, Office of the Chief of Naval Operations, Washington, D.C., December 1981.

Physical Security and Loss Prevention Manual, OPNAVINST 5530.14, Office of the Chief of Naval Operations, Washington, D.C., December 1981.

Standard Organization and Regulations of the U.S. Navy, OPNAVINST 3120.32A, Office of the Chief of Naval Operations, Washington, D.C., March 1979.

U.S. Navy Explosive Safety Policies, Requirements, and Procedures, OPNAVINST 8023.2B, Office of the Chief of Naval Operations, Washington, D.C., December 1981.

United States Navy Ordnance Safety Precautions, NAVSEA OP 3347, Naval Sea Systems Command, Washington, D.C., February 1979.

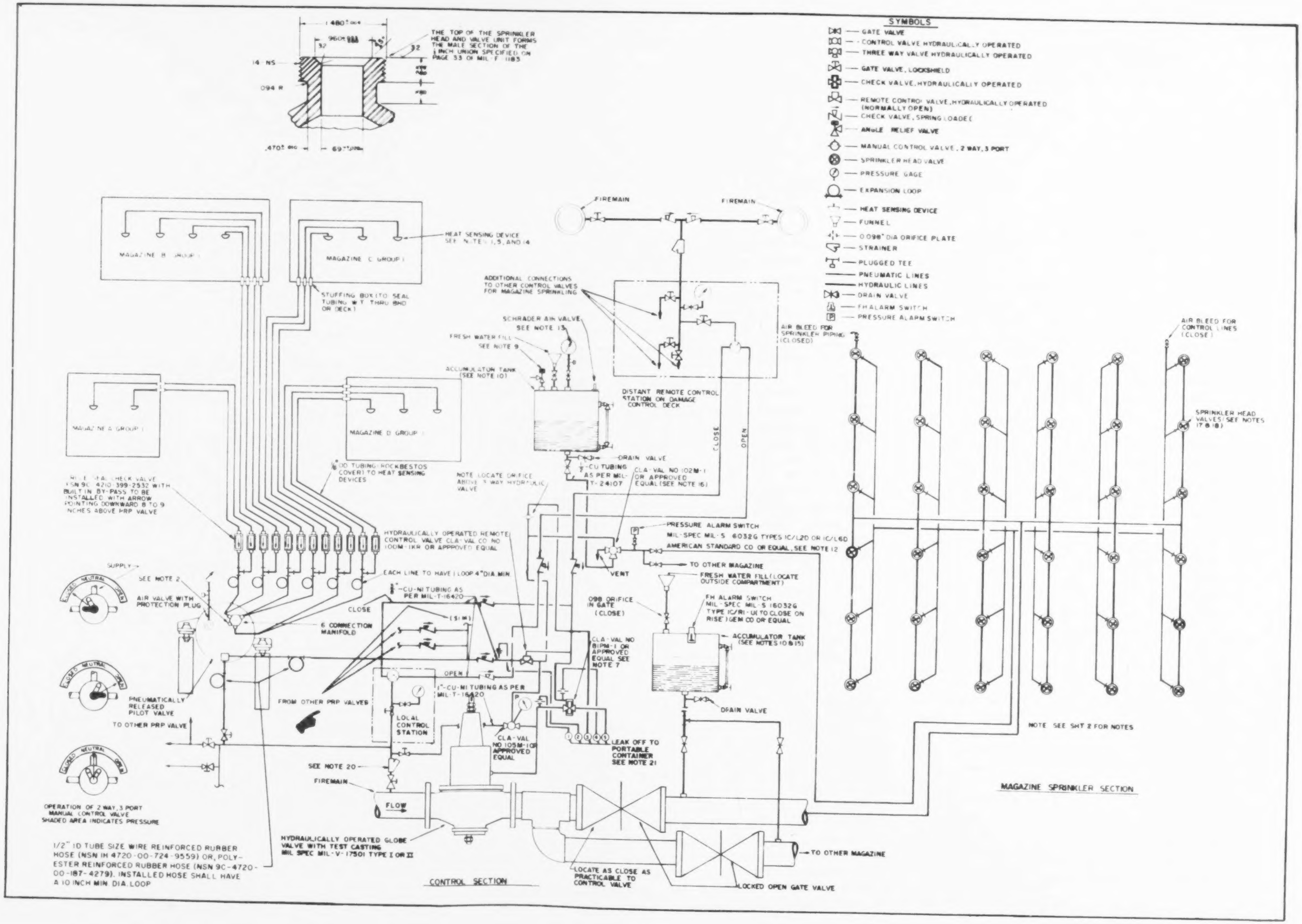

1.480
.960
32
32
THE TOP OF THE SPRINKLER HEAD AND VALVE UNIT FORMS THE MALE SECTION OF THE 1 INCH UNION SPECIFIED ON PAGE 33 OF MIL-F-1183
14 NS
.094 R
.470
.697
SYMBOLS
GATE VALVE
CONTROL VALVE HYDRAULICALLY OPERATED
THREE WAY VALVE HYDRAULICALLY OPERATED
GATE VALVE, LOCKSHIELD
CHECK VALVE, HYDRAULICALLY OPERATED
REMOTE CONTROL VALVE, HYDRAULICALLY OPERATED (NORMALLY OPEN)
CHECK VALVE, SPRING LOADED
ANGLE RELIEF VALVE
MANUAL CONTROL VALVE, 2 WAY, 3 PORT
SPRINKLER HEAD VALVE
PRESSURE GAGE
EXPANSION LOOP
HEAT SENSING DEVICE
FUNNEL
0.098" DIA ORIFICE PLATE
STRAINER
PLUGGED TEE
PNEUMATIC LINES
HYDRAULIC LINES
DRAIN VALVE
FH ALARM SWITCH
PRESSURE ALARM SWITCH
MAGAZINE B GROUP
MAGAZINE C GROUP
HEAT SENSING DEVICE SEE NOTES 1, 5, AND 14
STUFFING BOX (TO SEAL TUBING W.T. THRU BHD OR DECK)
FIREMAIN
FIREMAIN
ADDITIONAL CONNECTIONS TO OTHER CONTROL VALVES FOR MAGAZINE SPRINKLING
SCHRADER AIR VALVE SEE NOTE 13
FRESH WATER FILL SEE NOTE 9
ACCUMULATOR TANK (SEE NOTE 10)
DISTANT REMOTE CONTROL STATION ON DAMAGE CONTROL DECK
AIR BLEED FOR SPRINKLER PIPING (CLOSED)
AIR BLEED FOR CONTROL LINES (CLOSE)
SPRINKLER HEAD VALVES (SEE NOTES 17 & 18)
CLOSE
OPEN
MAGAZINE A GROUP
MAGAZINE D GROUP
1/8" OD TUBING (ROCKBESTOS COVER) TO HEAT SENSING DEVICES
RISE SEAL CHECK VALVE FSN 9C 4210-399-2532 WITH BUILT IN BY-PASS TO BE INSTALLED WITH ARROW POINTING DOWNWARD 8 TO 9 INCHES ABOVE PRP VALVE
DRAIN VALVE
1/2"-CU TUBING AS PER MIL-T-24107
CLA-VAL NO 102M-1 OR APPROVED EQUAL (SEE NOTE 16)
NOTE LOCATE ORIFICE ABOVE 3 WAY HYDRAULIC VALVE
HYDRAULICALLY OPERATED REMOTE CONTROL VALVE CLA-VAL CO NO 100M-1KR OR APPROVED EQUAL
PRESSURE ALARM SWITCH MIL-SPEC MIL-S 60326 TYPES IC/L2D OR IC/L6D AMERICAN STANDARD CO OR EQUAL, SEE NOTE 12
VENT
TO OTHER MAGAZINE
FRESH WATER FILL (LOCATE OUTSIDE COMPARTMENT)
.098 ORIFICE IN GATE (CLOSE)
FH ALARM SWITCH MIL-SPEC MIL-S 160326 TYPE IC/RI-UI TO CLOSE ON RISE) GEM CO OR EQUAL
ACCUMULATOR TANK (SEE NOTES 10 & 15)
DRAIN VALVE
SUPPLY
SEE NOTE 2
CLOSED NEUTRAL OPEN
AIR VALVE WITH PROTECTION PLUG
EACH LINE TO HAVE 1 LOOP 4" DIA. MIN
3/8"-CU-NI TUBING AS PER MIL-T-16420
CLOSE
(SIM)
6 CONNECTION MANIFOLD
CLA-VAL NO 81PM-1 OR APPROVED EQUAL SEE NOTE 7
OPEN
1"-CU-NI TUBING AS PER MIL-T-16420
PNEUMATICALLY RELEASED PILOT VALVE
FROM OTHER PRP VALVES
LOCAL CONTROL STATION
TO OTHER PRP VALVE
CLA-VAL NO 105M-1 OR APPROVED EQUAL
1 2 3 4 5
LEAK OFF TO PORTABLE CONTAINER SEE NOTE 21
SEE NOTE 20
FIREMAIN
FLOW
NOTE SEE SHT 2 FOR NOTES
MAGAZINE SPRINKLER SECTION
OPERATION OF 2 WAY, 3 PORT MANUAL CONTROL VALVE SHADED AREA INDICATES PRESSURE
1/2" ID TUBE SIZE WIRE REINFORCED RUBBER HOSE (NSN 1H 4720-00-724-9559) OR, POLYESTER REINFORCED RUBBER HOSE (NSN 9C-4720-00-187-4279). INSTALLED HOSE SHALL HAVE A 10 INCH MIN DIA. LOOP
HYDRAULICALLY OPERATED GLOBE VALVE WITH TEST CASTING MIL SPEC MIL-V-17501 TYPE I OR II
CONTROL SECTION
LOCATE AS CLOSE AS PRACTICABLE TO CONTROL VALVE
LOCKED OPEN GATE VALVE
TO OTHER MAGAZINE

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Figure 6-20.—Control system for wet-type magazine sprinkling system.

CHAPTER 7

SHIP EVOLUTIONS

As the title indicates, this chapter is designed to cover the various aspects of ship evolutions directly affecting weapons department personnel. The combatant ship is, in reality, nothing more than a weapons platform, and keeping the ship on the line is the only way that the weapons platform can be truly effective. The major element directly related to keeping the ship on the line is seamanship. Thus, some of the topics covered are mooring, docking, and underway replenishment, as well as helicopter operations for the small combatant. Safety is stressed throughout this chapter, as no operation can be effectively and economically carried out if personnel and equipment are damaged as a result. Planning and safe procedures are the backbone of good seamanship, and good seamanship is the basic ingredient of efficient and effective operations in any ship evolution.

SHIP EVOLUTIONS INVOLVING THE WEAPONS DEPARTMENT

Mooring, in the strictest naval sense, means tying up to a moored buoy or mooring with two anchors. There are several excellent references on the subject, such as *Naval Shiphandling* by Crenshaw, and *Knight's Modern Seamanship* by Knight. Both have several revisions and editions. These publications cover the subject from the shiphandler's point of view, however, with some reference to the most common methods of rigging the moor. It would not serve our purpose to cover the same ground here because these publications are normally available aboard ship. Other excellent references appear in several of the series of Navy training courses. These books cover the "nuts and bolts" of the standard Navy methods of mooring and docking, and all other aspects of seamanship. But even these books are limited in the number of topics covered; remember that there is not one absolutely correct way to do anything in seamanship, because no two sets of conditions are exactly the same. However, deviations from a standard Navy method must be well planned and follow good seamanship practice and safety.

When coming into port, the weapons officer and the first lieutenant should keep themselves informed as to the progress of their personnel in preparation for mooring or going alongside. They must also keep themselves informed as to any change in plans as to where the ship will moor, as this will affect the positioning of gear on deck and may even require some gear being struck below and other gear being broken out and positioned on deck. This information must be relayed to the petty officer in charge of a particular operation in a timely fashion so last minute changes can be made which may require more personnel or more and different gear. For instance, such a simple matter as having to drop an anchor at short stay while waiting for last minute changes in the ship's entering port routine to clear will require the breaking out of fire hoses to clean the anchor off before securing it. On a forecastle with plenty of room this doesn't present too large a problem, but on a smaller vessel where sufficient room is not available, the space, time, and manpower requirements for this simple task can come into conflict. Some of the standard methods of mooring follow.

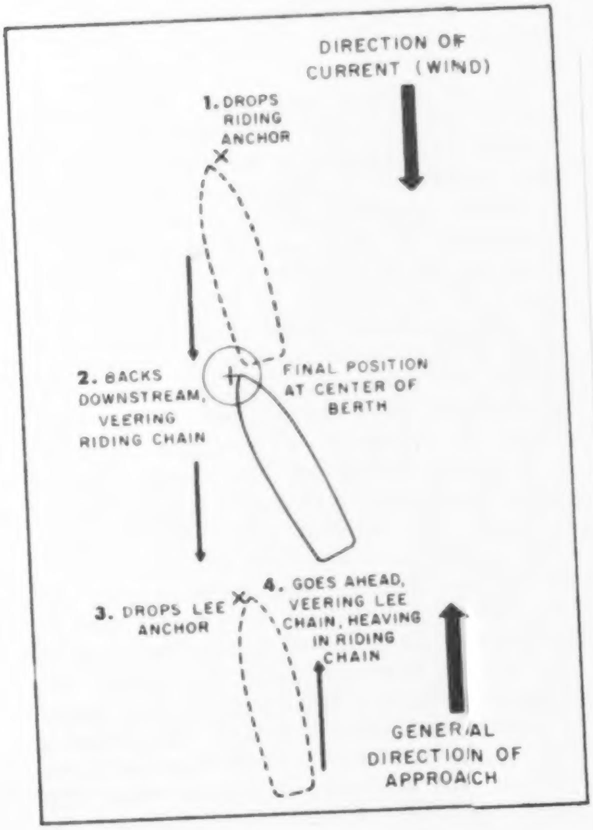
MOORING

Though the art of mooring to two anchors (figure 7-1) is seldom seen today in the U.S. Navy, the practice is very useful and merits the consideration of the accomplished mariner. A classical moor is to drop two anchors a substantial distance apart and then adjust the scope of chain to each until the ship's bow is held securely midway between the two anchors. If the ship may be moored for a considerable time and may swing around its moor with the change of tide, it is normal with naval ships to insert a mooring swivel in the rig to prevent the chains from fouling.

The advantage of mooring in this manner is that the bow of the ship is snubbed to one place. When the ship is assigned to a small anchorage, if it is moored so that its mooring swivel is over the center of its berth, it can swing with the tide and wind and its stern will never extend much more than a shiplength from the center of the berth. The ship might require twice this radius of clearance were it to anchor normally. (See figure 7-2.)

A ship at anchor is usually lying in a tideway heading up against the tidal current. At each change in the direction of the current, the ship swings around its anchor and heads in the opposite direction. If the ship is riding to a single anchor, the radius of swing is the horizontal distance from the anchor to the hawsepipe, plus the length of the ship. Frequently, it is necessary to confine the ship to a smaller circle of swing, and this is done by mooring with two anchors, laid in a line that parallels the direction of the current.

The upstream anchor is called the riding anchor, and the other the lee anchor. The ship rides between them to equal lengths of chain, and its area of swing is thus confined to a circle whose


DIRECTION OF CURRENT (WIND)
1. DROPS RIDING ANCHOR
2. BACKS DOWNSTREAM, VEERING RIDING CHAIN
FINAL POSITION AT CENTER OF BERTH
3. DROPS LEE ANCHOR
4. GOES AHEAD, VEERING LEE CHAIN, HEAVING IN RIDING CHAIN
GENERAL DIRECTION OF APPROACH

63.64

Figure 7-1.—Mooring with two anchors.

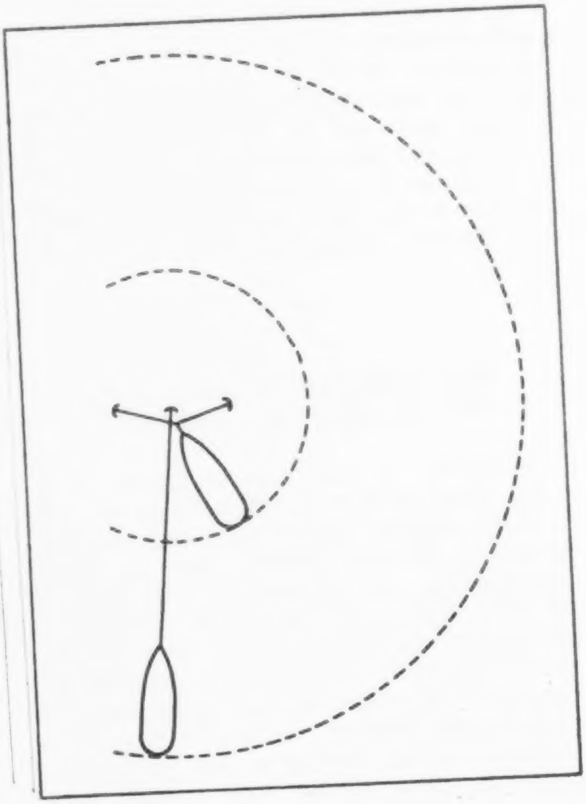


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Figure 7-2.—Space advantage in mooring.

radius is not much greater than the ship's own length.

When making an ordinary moor, the ship steams slowly upstream, reducing headway gradually so as to come to a stop at the point where the riding anchor is to be let go. After the anchor has been dropped, the ship is backed slowly downstream, veering chain on the riding anchor, until over the place where the lee anchor is to be let go.

Certain calculations, however, must be made in advance. The first is the determination of the horizontal distance from the center of the berth to the point where the riding anchor is to be let go. This will depend upon three considerations: (1) the designated scope of the riding chain; (2) the vertical distance from the hawsepipe to the bottom at the center of the berth (which is equal to the depth of water plus the height of the hawsepipe above the surface); and (3) the amount of slack (drift) required in the chain. A certain amount of drift is necessary, so that a detachable link will be available on the forecastle head for inserting the mooring swivel.

Drift is the distance from the final position of the mooring swivel outside the hawse to the point on deck where the detachable link must be when breaking the chain to insert the swivel. It includes all slack necessary to work the chain after the anchors have been dropped. The amount of drift in the two chains will differ slightly in the Eldridge method and a great deal in the O'Neil method, which we will discuss later.

A slack moor not only enlarges the radius of the ship's swing, but puts a heavy strain on the chains in the event that the ship should head to a cross stream wind and ride to a span.

As soon as the lee anchor hits the bottom, the riding chain is heaved in and the lee chain is veered until the chains are even and both detachable links are available on the forecastle head. The mooring swivel is then inserted in the chains, as described later in this chapter.

If you are on a ship with a short forecastle, it may not be possible to make a bench mark on deck since it could be that you would require as much as 45 feet between the hawse and the wildcat (half a shot of chain).

You should, however, be able to devise some method of determining when to drop the other anchor. One simple method would be to send a small boat out to buoy the exact spot. Another might be to mark the chain itself, figuring from the detachable link that will be immediately outboard of the hawse when the second anchor is dropped.

In the flying moor the ship drops the lee anchor first, then works up under its own power to the point where the riding anchor is to be let go. The flying moor is quicker than the ordinary moor. Also, the ship's maneuvering is not limited to the direction of stream.

The bench mark is used in a similar manner in the flying moor, except that, in this instance, it is a detachable link on the lee chain that indicates when to let the riding anchor go.

In both the ordinary and the flying moor, both chains lead to the same hawsepipe; they are connected outside its lip to a mooring swivel that allows the ship to swing without twisting the chains around each other. Most of the actual work of mooring consists of dipping one anchor chain around the stem into the other's hawsepipe and inserting the swivel in the chains. These steps are carried out by either the Eldridge or the O'Neil method.

Eldridge Method

In the Eldridge method (figure 7-3), the chain from one anchor is shifted to the other's hawsepipe before either anchor is let go. It makes no difference whether an ordinary or a flying moor is being made.

The chain of the riding (upstream) anchor is broken inboard of the bending (swivel) shot. The end of the next shot is led out through the lee hawse, around the bow, into its own hawse, and reconnected to the bending shot. After both anchors have been dropped, the swivel is inserted in the lee chain. Then, the riding chain is broken again and the outboard section connected to the swivel. Finally, the swivel is walked out clear of the hawse.

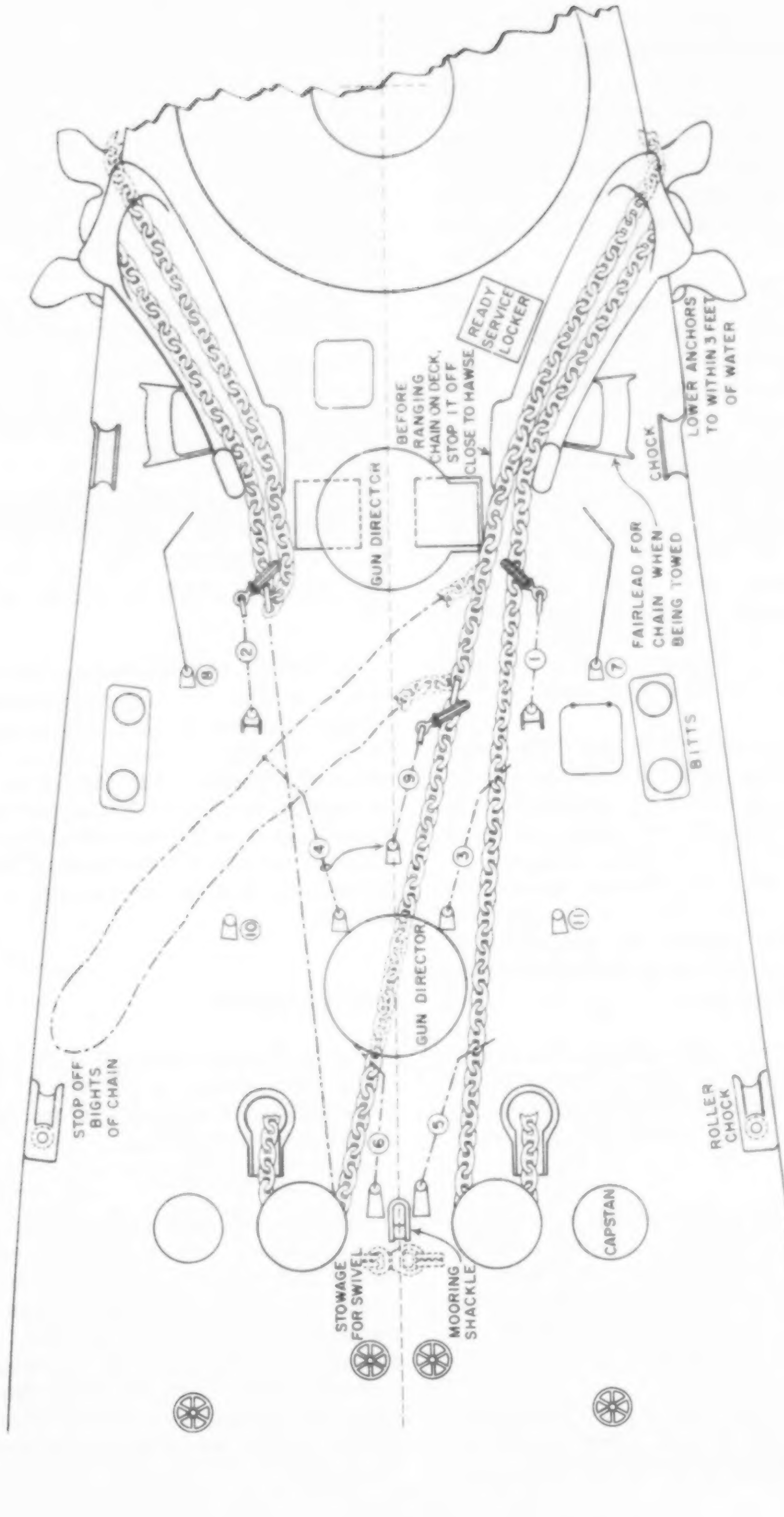
STOWAGE FOR SWIVEL
MOORING SHACKLE
CAPSTAN
ROLLER CHOCK
STOP OFF BIGHTS OF CHAIN
GUN DIRECTOR
GUN DIRECTOR
BEFORE RANGING CHAIN ON DECK, STOP IT OFF CLOSE TO HAWSE
READY SERVICE LOCKER
CHOCK
LOWER ANCHORS TO WITHIN 3 FEET OF WATER
FAIRLEAD FOR CHAIN WHEN BEING TOWED
BITTS
1
2
3
4
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Figure 7-3.—Eldridge method of putting on mooring swivel.

O'Neil Method

The O'Neil method (figure 7-4) differs from the Eldridge method in two respects. First, the anchors are dropped prior to dipping the chain; and second, the swivel is inserted in the chain of the riding anchor.

Let us assume that the port anchor is to be the riding anchor. The drift on the riding chain will be from a point abaft the housing stopper to the final position of the mooring swivel. Drift on the lee chain will be from the outboard lip of the starboard hawsepipe to the starboard housing stopper plus the distance from that stopper out through the starboard hawse, around the bow, and in through the port hawse to the point where the swivel will be when connecting up. If this distance is excessive, it can be reduced by holding the lee chain at the water's edge while the chain is broken, dipped, and connected to the swivel. Use the clear hawse pendant and a stout preventer for holding the chain. Naturally the latter procedure will result in a tauter moor.

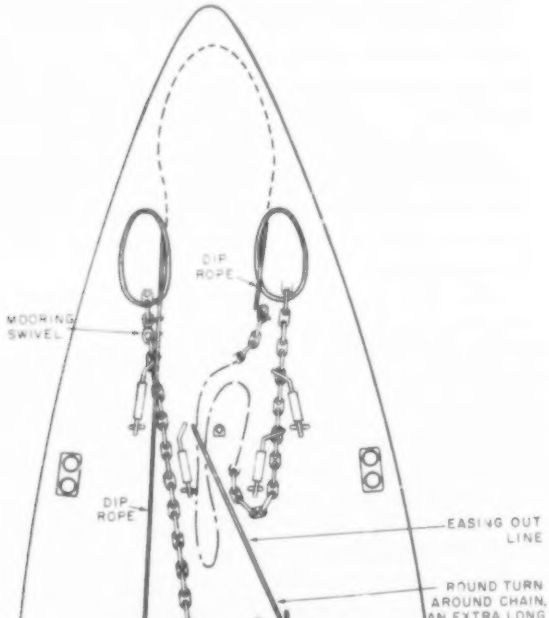

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Figure 7-4.—O'Neil method of putting on mooring swivel.

Once both anchors have been let go, heave in on the port chain until the proper detachable link is on deck abaft the housing stopper. Pass both stoppers, and disconnect the chain. Insert the swivel, cast off the stopper, and walk the swivel out to the lip of the hawse.

While inserting the swivel in the riding chain, heave in on the lee chain. Remember that you must have the detachable link far enough abaft the stopper (or the pelican hook on the clear hawse pendant) so that the chain in between will reach around to the mooring swivel.

Stop off the chain, and bend on a stout easing out line in such a manner as to enable you to release it when the attachment point is outside the ship. Disconnect your chain and heave round on the dip rope, paying out the easing out line as necessary. To control the chain, you may have to shift the easing out line once or twice.

When the end of the starboard chain is back on deck, connect it to the mooring swivel. Cast off your stoppers (clear hawse pendant), dip rope, while easing out the line. Walk out the swivel to its final position.

Buoy Moor

In the buoy moor, a pad eye on the top of a mooring buoy contains a large ring to which a ship shackles its anchor chain. Small ships, such as destroyers and minesweepers, formerly moored by the bight of the chain, with the end secured back on deck. This practice, although it provided a convenient means for a quick release, did a good deal of bending damage to the chain, and has been discontinued from general usage.

Upon approaching the buoy, the ship lowers a boat containing a buoy party of three or four crew members wearing lifejackets. (Some commands require hardhats to be worn by the buoy party.) The ship reduces headway so as to come to a dead stop with its bow half a ship's length from the buoy. The boat brings its stern under the ship's bow. The end of a 5-inch dip rope and the end of about a 2 1/2-inch messenger are lowered to the boat, together with the eye of about a 1 3/4-inch wire, containing a mooring hook or a shackle large enough to engage the ring of the buoy. The boat proceeds to the buoy, and two crew members get on the buoy. The buoy party secures the wire to the ring of the buoy with the mooring hook or the shackle. The dip rope is passed through the ring and bent to the messenger, which is used to haul the end of the dip rope back on board. The buoy party gets back into the boat while the ship hauls its bow over the buoy. The crew members must not remain on the buoy during this process because the buoy always cants and, at times, spins.

The chain to be used already has been disconnected from its anchor, and the mooring shackle secured to it with a detachable link.

One end of the dip rope is bent to the chain just above the shackle, and the other is led to the capstan. By walking out the chain and heaving on the dip rope, the shackle is maneuvered out to the buoy. When the end of the chain is in position, the buoy party should be ready to secure it to the ring. When this is done, they cast off the wire, and the moor is complete. There are, of course, many variations to the particular method noted here, the major one being the trolley method (figure 7-5).

Mediterranean Moor

The Mediterranean moor (figure 7-6) consists of dropping both anchors, widely spaced, and backing the stern into a pier or mole where it is secured by a stern line and two quarter lines, preferably crossed under the stern. This moor allows greater use of the dock space and enables each ship to place its own brow to the pier.

For best security of the moor, the chains should tend 60° out from each bow, but crowded harbor conditions seldom allow such separation. Frequently it is necessary to settle for as little as 30°. Even this, however, gives a secure moor for all except the most severe winds.

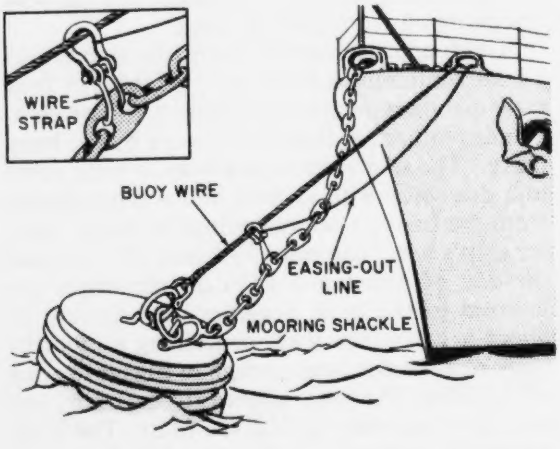

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Figure 7-5.—Trolley method.

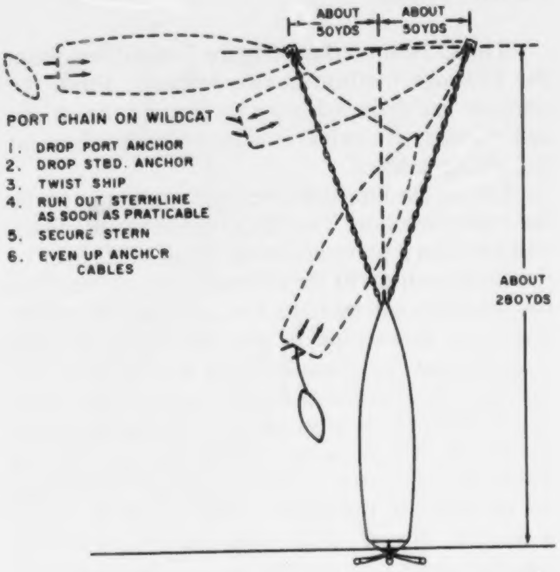

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Figure 7-6.—Steps in making a Mediterranean moor.

Because ships with only one anchor windlass experience the most difficulty with this moor and because ships larger than destroyers usually have a tug to assist, we will discuss the moor as made by a destroyer.

The first item in preparing for a Mediterranean moor is to decide how far from the mole to drop the anchors. This distance depends on the length of the ship, the amount of chain to be used, and the angle that the chain will tend.

It is desirable to have the anchors well out because with only one windlass, the anchors must be worked one at a time. Safety requires that this time-consuming task be accomplished as far from shore as possible. A good scope of chain is 75 fathoms, allowing a 30-fathom margin for error on the shorter chain (105 fathoms).

With a 390-foot vessel using 75 fathoms of chain, and the stern close to the mole when secure, the anchor should be dropped approximately 280 yards from the mole. The most advantageous approach is parallel to the mole. The first anchor should be let go when the hawse is about 50 yards short of the center line of the berth and the second let go when the bow is about 50 yards past the line. After dropping the first anchor, put the rudder hard over to prevent the chain from getting under the ship. After letting go the second anchor, the ship is twisted and backed toward the mole, veering chain as necessary. The cable of the first anchor should be handled on the wildcat, and the other can be handled from its compressor.

As soon as possible, the stern line should be run to the mole, and particular care must be taken to keep the slack out of this line lest it become fouled in the screws.

If the construction of the stern permits, the quarter lines should be crossed, as this ensures a more secure moor.

After the stern has been secured, the moor is made taut by heaving in and equalizing the strains on the anchor cables. Both chains must take a moderate strain and stand well out of the water in order to hold the stern off the mole.

An approaching storm warrants the particular attention of the weapons officer and the first lieutenant. If it is not possible to stand out to sea, the ship must ride out the gale at anchor as best it may. The first step in combatting this danger is to veer to the safe maximum scope of chain. But as an experienced seaman, you no doubt have witnessed the pronounced yawing of a ship riding to a single anchor. During a violent storm, this yaw may be as great as 80°, and a ship is in great danger of dragging anchor or even parting its anchor chain. Dropping a second anchor underfoot will greatly reduce this surging.

Hammerlock Moor

A better method of ship control is the foul weather moor (also known as the hammerlock moor).

There is no special problem in accomplishing this moor. You merely make a second anchor ready for letting go. The key to the operation is the spot at which the second anchor is dropped. Location of the drop point is determined by the predicted path of the storm.

The most desirable situation is to present to the wind the open end of the V formed by the anchor chains. To accomplish this, you must take into consideration your position on earth and the direction that the storm will pass.

All storms rotate, winds within them blowing in a circle rather than a straight line. Hence, in relation to a fixed position on earth, the direction of the wind shifts as the storm moves along its course. In the Northern Hemisphere, the wind direction is counterclockwise; and in the Southern Hemisphere, clockwise. Thus, in the Northern Hemisphere, if the storm is expected to pass to the east, use the starboard anchor as the riding anchor. If it will pass to the west, use the port anchor. In the Southern Hemisphere, the reverse is true.

When information on the storm is received, and the ship is riding to the wrong anchor, heave in and drop the correct anchor. Otherwise, merely ready the secured anchor for letting go and veer the riding chain to the proper scope.

When the ship has begun to yaw, drop the second anchor at the end of the arc that bears in the direction from which the wind is expected to change its own direction. Dropping the second anchor in this position ensures a wide out-of-step moor (the underfoot anchor not in line with the ship and riding anchor). Veer the chain of the second anchor to about 10 fathoms more than the depth of the water. More chain may be used for a better drag, but do not pay out a scope that will allow the anchor to hold.

The ship is riding to the starboard anchor; the port underfoot anchor with 20 fathoms of chain is slowly dragging because of the chain's short scope. A longer scope would permit the anchor to hold, but that is not desired. Although dragging, the underfoot anchor holds the bow steady against the wind and prevents yaw. Its drag allows the ship to swing slowly as the wind changes direction.

Should the storm depart from its predicted track and pass on the side opposite to the one you are prepared for, you will still have a foul weather moor. In this case, the underfoot anchor will pass underneath the riding anchor chain as it drags. There is no appreciable danger that the chains will become fouled, but to preclude this possibility, the underfoot anchor should be weighed as soon as the weather moderates.

CAUTION: Occasionally, peculiarities in construction cause special anchor handling problems. Ships with bow-mounted sonars must take care not to permit the anchor cable to injure the sonar dome mounted at the forefoot. Ships so equipped usually have a stockless anchor at the stem and a lightweight type on either the port or the starboard side. One class of ships being built will have a hawsepipe running through the keel abaft of the sonar dome. When using the bower anchor, the ship must be dead in the water or have sternway on before letting go, and must be dead in the water until the anchor is clear of the water when hauling in.

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The bow and stern buoy moor is used by all navies. It is seen and used throughout the world where harbors are small and congested, or in areas where ships are out of service. It eliminates the need for any involved rigging process, such as an Eldridge moor. But, since it leaves the ship hanging in the bight of a span, the buoys must be well anchored.

In this type of moor, mooring the ship's bow to the forward buoy is accomplished in the same manner as described in the section on buoy moors. At the same time, a stern line or a cable is run to the stern buoy. The ship approaches at an angle of about 20° to the two buoys' geographical line of bearing. While lines are being passed to the bow buoy party, similar lines are being passed from the ship by boat to the stern buoy party. After the lines are made fast to the buoys, adjustments are made from on deck to spot the ship equidistant, bow and stern, from the respective buoys. Most ships use a chain forward and a wire rope aft.

DOCKING

The word *docking* is used in two senses: (1) going alongside a pier or wharf and (2) entering drydock. As a weapons officer, you will do one many times and the other a few times. Preplanning is essential in both if the ship is going to be known as a smart ship.

Most ships, if not all, have a standard mooring line layout that can be found in the *Ship's Organization and Regulations Manual* or, in some ships, the weapons department instructions. This will take care of much of the preplanning for this evolution. However, the bill must be followed in practice as much as possible so that the consistency of organization and practice may be effective. The bill will also aid you by predetermining the number of crew members required for the evolution and where they are to be stationed. On some ships (such as carriers) these crew members are not from the weapons department and are not used to working about deck spaces, even though at one time or another they may have spent some time in the deck department. This lack of familiarity will make your job and your petty officers' jobs inherently more difficult. All personnel on line handling stations must be adept at handling the various items of equipment, such as the lines themselves and hand-held fenders. They must be familiar with the standard commands given on deck and be made aware of the hazards, some of which are quite innocent looking. Here is another opportunity for on-the-job training and instruction which should not be missed.

Mooring lines are numbered in sequence from forward aft and are given a second designation of being a spring or a breast line located by the portion of the ship from where they are handled. On a destroyer there are normally six numbered starboard/port bow spring lines (2 and 3), starboard/port quarter spring lines (4 and 5), and the stern line (6). A breast line may be put over midships, but this is not numbered in standard practice. On other ships, the number of lines may be the same or greater, depending on the class. On a CV class ship, there may be ten or more lines in addition to Dutch bollards that act as breast lines.

The secret to smart line handling is the proper laying out of all gear to be used in mooring and the proper placing and faking down of mooring lines. With all gear in its proper place, it can be used in proper sequence without the personnel getting in each other's way. When the personnel are not needed for a particular portion of the sequence of events, they should stand by in the safe zone created by the previously positioned and properly worked and placed gear.

When a ship is being brought into drydock, no matter what type it is, the usual practice is to enter the ship over the blocks, set out following the ship's docking plan. The ship should be worked into the dock with tugs providing the motive power and the ship lines providing the centering and some small portion of the motive power in a pulling fashion. Once the ship is centered over the blocks, pneumatic "donkeys" controlling cables passed to dockside are used to hold it there. While the ship is proceeding into the dock, the mooring lines are put over on both sides in sequence. These lines are shifted from capstan to capstan, located on the sides of the drydock, as the ship continues into the dock under the direction of the docking officer. Your line handlers, at this state, are going to be directed by the docking officer in the performance of their duties. You and your officers will assist the docking personnel in seeing that instructions and orders are carried out in a smart seamanlike fashion. *Naval Ships' Technical Manual* (*NSTM*), chapter 997, gives a complete rundown on docking of ships.

There are some general rules of safe seamanship that must be observed in both mooring and docking. You and your first lieutenant and petty officers must see that they are not violated.

- If a chain locker is not self-stowing, personnel in the chain lockers must withdraw from them before any attempt is made to disconnect the windlass.

- If personnel are used to stow the chain in the locker, they must be provided with adequate illumination and appropriate personal safety gear.

- While handling the brake and letting go an anchor, windlass operators should wear goggles.

- Personnel must stand clear of the windlass when heaving around or veering the anchor.

- Only personnel who have been instructed in the duties required and are authorized should be allowed to operate capstans, winches, and windlasses.

- Lines should never be made fast to capstans or gypsy heads.

- If hawsepipe covers are not used, a safety guard should be installed forward of each hawsepipe to prevent personnel handling lines or on a lookout from stepping or falling into the opening.

- Always stand clear of bights in a line.

- Personnel must not be permitted to sit or lean on the lifelines.

- In maneuvering alongside a dock or during drills or evolutions, personnel are required to keep well clear of lifelines.

- When lifelines are removed for an extended period, officers and petty officers concerned must ensure that emergency lines are rigged to protect personnel.

- Personnel must not be permitted to work over the side unless wearing lifejackets. They must have safety lines around them, properly tended by someone on deck. Personnel working outside the lifelines (rigging or unrigging gangways or for any other reason) must wear lifejackets.

- Ring buoys with a line attached must be kept available when sea ladders or Jacobs' ladders are in use or whenever personnel are working over the side. During all evolutions, personnel on deck are required to wear properly fitting lifejackets. At night, a one-cell flashlight and whistle are secured to each jacket.

- Points of wear on mooring lines, towlines, and so forth, must be well protected with chafing gear.

- Never allow personnel to stand in the line of sight down a working line or in the immediate area of such a line.

- Never stand outboard of a line or on faked down lines.

ANCHORING

Most ships have a vertical shaft type of anchor windlass, and let go the anchor by releasing the pelican hook on a chain stopper. Your forecastle gang will have to make extensive preparations before you can report that the anchor is ready for letting go. The special sea detail portion of your watch, quarter, and station bill sets up the stations to be manned.

After all stations are properly manned, the person in the anchor windlass room engages the wildcat. Then the anchor windlass operator takes a slight strain on the chain and releases the brake. All stoppers are removed except the most forward one (housing stopper), and the pelican hook on that stopper is shifted back one link. This shift is necessary to ensure that the anchor will be loose in the hawsepipe when the chain has been walked out until the stopper again has the strain of the anchor. The chain is walked out a little more to allow some slack forward of the windlass. This gives the anchor sufficient momentum to overcome the inertia of the chain between the windlass and the chain locker when the stopper is released.

The brake is then set up slightly to keep the weight of the chain from taking charge and dragging the slack back to the chain locker. This tension on the brake must be released immediately when the anchor starts from the hawsepipe. The windlass then is disconnected. On the order "Stand by to let go," a person with a heavy maul mans the stations by the remaining stopper, and another mans the station by the locking pin of the pelican hook. At the command "Let go," the pin is pulled out and the bale is knocked away. Both crew members must jump clear at once to avoid possible injury.

When the anchor hits bottom, there will be a visible slackening in the speed of the chain through the hawsepipe; the person stationed at the windlass should start braking to keep the chain from piling up on the anchor. In a normal situation of bringing a ship to, the judicious use of the friction brake and the ship's engines will facilitate laying out the chain. When the anchor is used as an aid to shiphandling, the conning officer will give specific orders to the anchor detail, after the command "Let go." As the ship moves forward (or aft), the chain is veered by slackening the brake until the scope prescribed by the conning officer has been reached. Then the brake is set up. When the ship is fetched up, the bridge is informed. The stopper is passed when directed by the conning officer.

On ships with a horizontal shaft windlass, the anchor must be let go by releasing the brake. First the devil's claw stopper is released by backing off on its turnbuckle, and the pawl (if any) is turned over to clear the chain. There is usually no problem in getting the anchor started, for there is no chain on deck to hold it back. If it does fail to start when the brake is released, strike the chain with a piece of timber.

All hands must keep well clear of the fore-and-aft line of the wildcat as the anchor is let go. Otherwise debris from the chain locker which sometimes comes flying over the wildcat may cause injuries to personnel.

Once the anchor is down, it is your responsibility to keep the bridge informed of the status of the chain. The conning officer must have information concerning the amount of chain out, direction the chain tends, and strain on the chain so that proper use may be made of the engines and rudder.

Standard terminology is always used in making anchoring reports. For example, as each detachable link passes the windlass, report: "Fifteen fathoms on deck!"; "Thirty fathoms on deck!"; and so forth. Once the chain has stopped veering, report: "(Number) fathoms at the water's edge!" With each report include which way the chain is tending by using clock-hand terminology (9 o'clock, 2 o'clock, and so forth); supplement this report by an arm motion in the direction in which the chain is leading. Report strain on the chain: "No strain," "Slight strain," "Heavy strain," and so forth. Report immediately when the chain tends across the stem, and continue veering chain while this situation exists. If the brake was set or a strain was taken under those conditions, links engaging the stem, especially detachable links, might be bent.

The fact is self-evident that too short a scope of chain will tend to raise the shank of the anchor from the bottom, causing the ship to drag anchor. The reason for avoiding too long a scope is not so obvious. If a ship having too long a scope is subjected to heavy weather, a strain much stronger than normal is placed on the chain. More and more of its length lifts off the bottom as the strain increases. If the scope is not too long, the chain lifts all the way to the shank, and the anchor breaks out and drags before the chain parts. With too long a scope, however, before the entire length of the chain lifts off the bottom, the breaking strain is reached and the chain parts.

Under normal conditions, a ship usually anchors to a scope of chain that is between five and seven times as long as the water is deep. When the force of wind or current increases, it becomes necessary to veer more chain to prevent the anchor from breaking out.

When the ship anchors in deep water, its approach to the anchorage should be made at a very low speed. During the approach, the anchor must be walked out to within a few (5 to 20) fathoms of the bottom and then let go. Even with the anchor close to the bottom, the chain's weight will cause it to run out wildly when the anchor is let go. Under such circumstances, it is easy to lose the chain. Therefore, exceptional care must be used to keep the chain under control by intelligent use of the brake.

At extreme depths (40 to 50) fathoms, it is advisable to walk the anchor all the way to the bottom.

Anchoring nomographs have been prepared to determine the minimum scope and the horizontal distance from the ship to the anchor. These nomographs represent the data used to determine the required scope of anchor chain, ship's resistance, and distance from anchor to ship. The nomograph is a tool for determining the foregoing without resorting to calculations. Anchoring nomographs apply only to the class of ship for which they are prepared. If nomographs are not available, they may be obtained from NAVSEA.

Information for using anchoring nomographs may be found in *NSTM*, chapter 581. Figure 7-7 shows an example of an anchoring nomograph.

When the special sea detail (or anchor detail) to get underway is stationed, you should ensure

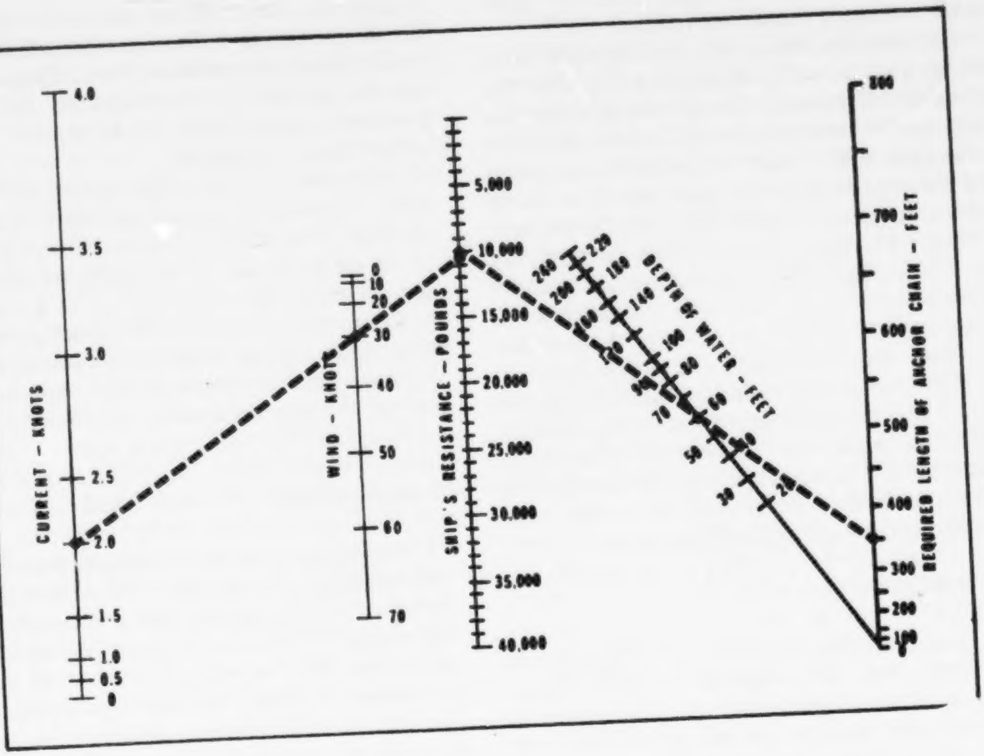

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Figure 7-7.—Anchoring nomograph.

that your personnel have the necessary equipment ready for use. This would include a fire hose (tested for adequate water pressure) to wash the mud off the chain and anchor, wrenches for chain stoppers, a small grapnel for recovering the anchor buoy, and paint pots and brushes to renew markings on the chain. It may not always be feasible to accomplish this remarking, but an opportunity should not be missed through lack of preparation.

Prior to heaving in, the anchor windlass is connected and a strain is taken on the chain sufficient to slack the stoppers. The stoppers are removed, the anchor buoy is brought aboard, and heaving in begins at the command "Heave around!" If the chain has been subjected to any severe strain during the time at anchor, each link should be inspected for distortion and sounded with a hammer as it comes aboard. Each chain marker is reported as it appears. You should also report the amount of strain on the chain and the direction in which the chain is tending.

The windlass should be heaved around slowly at first until the ship's deadweight is overcome and it begins to move toward the anchor. In the event that wind or current effect is putting undue strain on the windlass, inform the bridge so that the conning officer may relieve the strain by using the ship's engines. If the chain tends across the stem, order the windlass operator to "Avast heaving" until the ship swings clear. Here again the bridge can assist with engines and rudder.

All chain lockers on modern Navy ships are of the self-stowing type. However, you should have at least one person assigned to guard against any possible pileup in the chain locker. The chain can be kept from piling up by pushing any accumulation over with a length of two-by-four stock. Personnel must be especially cautioned against dropping this or anything else into the locker.

When the anchor is just about to break out, with the chain nearly vertical, the report is made "Anchor at short stay." Just as the flukes break out, with the crown still in the mud, word is passed "Anchor is up and down." Next comes "Anchor aweigh!" when the anchor leaves the bottom; and "Anchor in sight, clear (or foul) anchor!" when it comes into view.

Patent anchors frequently come up with flukes inboard, and on some ships they can foul the forefoot in this position. Usually the only way this fouling can be detected is by the sudden strain on the windlass, which must be instantly stopped to avoid parting the chain. A quick veer, braked to a sudden stop, will usually turn the flukes over the right way, but sometimes the anchor may require dropping again. However, most anchors will come right on in even with flukes inboard; the ship's side around the hawsepipe turns the flukes over when the shank enters the pipe. On some ships the inboard-pointing flukes engage the side and will prevent the anchor from housing properly. A quick veer will usually correct this situation. If not, a bull rope must be attached to a fluke and heaved from on deck to hold the flukes upright as the chain is taken in.

SHIP'S BOATS

As weapons officer or first lieutenant, you are responsible for the material condition and operation of the ship's boats. Although you will rarely be called upon to operate any of the craft or associated equipment, you should know the basics to assist and instruct your personnel in its operations. It is your responsibility to have enough trained coxswains to meet any commitment.

Boat Manning

The coxswain, as well as a qualified boat officer of a small craft must not only be familiar with but also have expertise in all details relating to the care and handling of the craft. Equally important, they must be able to instruct their crew in all aspects of general service and drills. They must keep abreast of the condition and completeness of the boat equipments, and report all deficiencies to their division officer. The boat coxswain is responsible for the appearance of the craft, as are you, both materialwise and personnelwise. The condition of the magnetic boat compass is often overlooked by the best boat coxswain and boat officer. The magnetic boat compass should always be checked against the ship's master gyrocompass before being sent on a mission, and a current deviation table should be posted in the boat. Coxswains and boat officers must study the chart of the harbor, and a copy of the appropriate harbor chart should be a vital part of the boat's equipment. Boat officers and coxswains must be aware of senior officer present afloat (SOPA) instructions and enforce them. The ship's boat should reflect the standards of the ship; inadequate instructions on your part materially affect these standards.

You should ensure that during instruction to your coxswains, safety in boat handling is stressed. Personnel in boats will not be allowed to sit on gunwales or stand in the craft. There should never be smoking in the boat. For all weather conditions, the boat capacity ratings must be strictly enforced. Boat crews are required to wear proper life preservers while operating boats unless the requirement is lifted by competent authority.

Boat Handling

In the next several paragraphs we will discuss the handling of small craft, first from the standpoint of destroyers and then from amphibious warfare ships and similar types of ships. You will note that much of what is said can be applied to all classes of ships. On most small vessels, there is but a single motor whale boat, normally handled from a davit. Before swinging out a boat to be lowered, first make sure that the plugs are in. With quadrantal davits, your falls must be good and taut, otherwise your boat will not lift off the chocks. With any type of davit, the falls must be belayed securely. Each person in the boat must wear a lifejacket and must have a lifeline in hand. Run your sea painter outboard of everything on the ship, to the ship's side of the bow, and belay with a toggle, so you can let it go without any difficulty. If there are any preventer wires on the falls, they must be released before you start to swing out. After swinging out over the water, pass the frapping lines. The gripes must be let go, and the hinged half of the chocks dropped on boats in quadrantal davits.

The crew members stationed at the cleats slowly and carefully take off all but the two round turns. At the command "Lower away" they carefully start to slack, making certain they do not allow the hauling part to ride off the cleat. The Boatswain's Mate (BM) in charge watches to ensure a level boat, or slightly down by the stern, and if one end starts to get ahead of the other, order that end slowed. When the boat reaches the water and tows to the painter, the order "Up behind" is given, and the falls are thrown off the cleats. In releasing, the after block is always unhooked first. The boat's engine is started while the boat is in the air, but the clutch is never engaged until the falls are unhooked and hauled clear. Before starting ahead, great care must be taken that no trailing lines are astern that might foul the screw. When the boat runs ahead and the painter slackens, it is thrown off by the light line attached to it.

Hoisting/Lowering

Hoisting boats with davits is a little more complicated than lifting with a crane. In operating with davits, the boat attaches to the sea painter in the same manner, if the ship has headway, and must take the same precautions against broaching to when lifted. The lower block of the forward fall is slacked down to the bow hook first, and is always attached before the after block. Before being hooked on, the bow hook must rotate the block until all the twists are out of the falls; otherwise, a dangerous jam will occur as the blocks draw together. Once the forward block is hooked on (hook pointing aft), and the slack in the falls is taken up, the stern hook removes the twists in the after fall and then attaches the after block (hook pointing forward). Both then stand by to hold the releasing hooks closed by their lanyards. Lifelines from the span are lowered to the boat and each person aboard must keep one of them in hand (with 50 percent weight on it) as the boat is raised.

Frapping lines are passed around the falls. Then the order "Set taut" is given. At this order, power is applied to the hauling part of the falls either by man-hauling or winches. When the falls are taut and the boat is just about to rise, the BM orders "Avast heaving." Heaving is suspended while checking everything to ensure that nothing will carry away during the trip up to the deck. When satisfied, the BM calls out "Hoist away," and the steady heave up begins. The engine is secured and the plugs are pulled to drain the bilges. When the boat is high enough to swing in, the order "Avast heaving" is given again and heaving stops. Crew members in the boat now come aboard. The falls are held taut when the stoppers are passed. These short lines, usually braided and called rattail stoppers, are fastened securely to strong points on the davit above the cleats where the falls are to be belayed. A rolling hitch is passed around the fall and a short distance above that, a half hitch. Spiral turns then are taken in the reverse direction, and the end of the stopper married securely to the fall by hand.

When all the stoppers are passed, the order "Walk back" is given. If the falls are hoisted by hand, the person holding then walks back slowly and the stoppers gradually take the strain. If the falls are on catheads or capstans, they are slackened by slowly working the turns back so as to slacken the lines. No turns are thrown off because it is possible for a stopper to slip, resulting in the boat dropping. When the BM is satisfied that the stoppers have taken hold, he orders "Up behind." This order means to run back the slack. Until the falls are belayed on the cleats, only the stoppers are holding up the boat. Crew members at catheads or capstans rapidly throw off their turns, grab up a handful of slack, and run with it toward the cleat. Next order is "Belay." Because the boat must be lowered from the cleat, the falls must be belayed in such a manner as to permit lowering without any danger of dropping the boat. For belaying, two round turns and several figure eights are taken.

The process of hoisting and lowering boats with a crane is fairly simple. Chiefly, it entails handling the slings by the safety runner. The safety runner, a short wire pendant, is attached to the bill of the hook on a boat crane and is connected to a tripping line. A pull on the tripping line causes the safety runner to dump the ring of the boat slings off the hook.

When a boat comes alongside a ship underway to be hoisted in, it first secures the end of the sea painter—a long strong manila line that hangs over the side of the ship—forward of the spot where the boat will be hoisted. The shipboard end of the line is bent securely to a cleat or a set of bitts. The boat end is lowered with a light line to the bow hook, who hauls in all the slack, and bends the end of the forward cleat on the ship side of the bow. The sea painter is never bent to the boat's stem nor to the side of the bow away from the ship. If it should be, when the boat rides to the painter, it will dive against the ship's side and probably capsize. It is important also that the boat be driven ahead and allowed to drop back on the sea painter so as to be exactly under the crane before lifting. Otherwise, it may broach to and capsize as it starts to leave the water. Once the boat rides to the painter, the engine is secured and the slings are attached. Steadying lines should be secured to the cleats on the outboard side of the boat and brought back on deck to hold the boat steady as it rises. The bow hooks and stern hooks must fend it off the side. When the boat is in the air, the plugs should be removed so that its bilges will drain before it reaches the deck.

It is always easier to go alongside port-side-to than starboard-side-to because, when you put your port bow alongside and start to back, the side force of the backing screw on the stern will walk your after end nicely alongside. If you have to go starboard-side-to, remember that you must come alongside much straighter, because the backing screw will walk your stern away from the landing. Make a starboard-side-to landing at slow speed, so you will not have to back hard to stop the boat. When you tie up to a ship's gangway in a stream, always secure the boat line to the ship side of your bow and set your rudder a little away from the ship, so that the boat will ride clear. Tie up to a dock or landing bow-on to the stream whenever possible, so you can set your rudder to hold the boat off in the same manner. In getting underway from a starboard-side-to landing, usually it is best to back until the stern has walked itself away from the dock. If you have no room astern, hold the bow by the bow line and go ahead slowly with hard right rudder. When your stern is well out, shove off forward and go ahead with left rudder, but not so much rudder as to send the stern against the dock. If you try to get underway from alongside by going ahead, turning the rudder away from the pier or ship's side will send the stern hard alongside. The best way to get underway from a port-side-to landing is also to get your stern out first, but backing the engine here only tends to send it against the dock. It is better to go on the bow line with a hard left rudder, and your stern will walk out without difficulty. In both cases, the bow hook must do everything necessary to shove the bow wide by hand as you start to go ahead. The above procedure applies to single screw boats, MWBs, LCPLs, LCVPs, and so forth.

On twin propeller boats, such as LCMs, the starboard is a right-hand screw and the port is a left-hand screw. The lateral forces produced by one cancel those of the other when both are going ahead or astern. When one is going ahead and the other is going astern, however, the forces complement each other and the effect is doubled. For this reason, maneuvering in a twin-screw boat is considerably simpler than in a single-screw boat. To make a port-side-to landing, you would put over your bow painter, throw your rudders right full, back the starboard engine, and kick the port engine ahead. Adjust your throttles as necessary to keep from gaining headway or sternway. The stern will walk right in to the pier. To get out, the procedure is reversed—left rudder, port engine back, and starboard engine ahead. When the stern clears the boat astern, back both engines and the rudders and throttles to keep a steady course out of the slip. To turn, use right full rudder, port engine ahead, and starboard engine astern, and the boat will turn in little more than its own length.

When handling boats in moderate or rough seas, caution, good judgment, and seamanship are needed. One of the more frisky situations arises when a powerboat is running before a sea. When the hull is lifted by the stern, there is danger that steerageway and power may be lost when the screw and rudder are clear of the water. The boat may then swing around broadside to the seas. The coxswain must call upon all his skill in the use of the rudder to keep the stern to the mountains of water that sometimes are encountered when the going gets rough. It is helpful to reduce speed and to allow large swells to roll by. All passengers should be seated to lower the center of gravity with lifejackets ready. It is not good seamanship to surf with a power boat. With some boats, for example, swifts, this can be done and at a fairly good speed of advance (SOA). But the danger always exists of broaching. Common sense must be used to determine if the mission assigned requires the suspending of this important rule of seamanship. Running into a sea is less hazardous but not without peril in bad weather. Reduced speed lessens the strain on both engine and hull. To this end, the throttle should be adjusted so that the bow rises with oncoming waves instead of driving into them. On some boats, for example, swifts and crash boats, a quick ahead motion on the throttles will set the stern, raise the bow, and enable the boat to rise over a high wave. The danger of overpowering the boat and driving up and over the wave exists, however, with the result of free fall into the next trough, and going under the next swell. Taking the seas on either port or starboard bow is sound seamanship, too, because it lessens some of the pitch. Avoid the trough except in an emergency. When moving broadside to waves, turn the wheel momentarily so as to take larger wave crests on the windward bow; return to the course when conditions permit.

Securing For Sea

Boats are secured for sea when they are griped down in the chocks, with plugs out and boat covers stoppered down securely. Falls must be watched and slackened in wet weather. The ready lifeboat, usually a motor whaleboat, is secured for sea in the davits swung out ready for lowering. As a safety measure, wire preventers connected to the davit heads may be attached to the boat's hoisting eye. These preventers must be cast off before lowering. Preventers are equipped with pelican hooks which can be tripped to transfer the boat's weight back to the falls. The lifeboat has its sea painter already rigged, and the lifelines from the span are coiled down clear for running. To keep the boat from swinging, it is griped against a pair of soft puddings on a heavy spar, called a strongback, securely lashed between the davits. Canvas-covered lines running in a V-shape from the strongback around the boat to the deck are the gripes in this instance. They are brought down hard to the deck by a turnbuckle with a pelican hook for quick releasing.

Lifeboat Crew

As weapons officer, ensure that your personnel stand a taut lifeboat watch. Usually at the start of each watch, the lifeboat coxswain musters the crew, checks the boat and gear, has the engine tested, and reports to the officer of the deck. The crew must remain in the vicinity of the boat at all times. Many ships also require that a lowering crew stand by, particularly while the ship is lifeguarding for carrier air operations or for underway replenishments. If the boat must be used, the BM of the watch takes charge of lowering the boat.

If a person goes overboard and it is necessary to use a recovery boat, the coxswain must know how to approach a person in the water. The boat approaches the person from downwind so that the boat is not blown down on the person overboard. At the last part of the approach the engine is stopped and an attempt is made to recover the person at the bow. If possible, every attempt should be made to avoid having the screw turning over in the vicinity of the person in the water.

Fueling of Boats

Fueling boats is less hazardous than it used to be before the majority of ship's boats were equipped with diesel engines. But now and then you still find a gasoline engine. Diesel oil, too, can burn quite briskly when it is ignited. The chief danger of a gasoline boat lies in the highly explosive fumes from its fuel. These fumes can travel along a current of air and fire like a powder train, leading a blast back to the source or supply. The fumes are heavier than air, and may hang around indefinitely, even in the bilges of an open boat. Before starting a gas engine, every space subject to the accumulation of vapor must be thoroughly ventilated. Boats normally are fueled during the morning watch. Fueling at night occurs only in emergencies. Engines of all boats must be stopped before fueling. Gasoline boats must never be refueled except when in the water. In powerboats, no smoking or naked lights are permitted at any time. And none are allowed even in the vicinity of powerboats when fueling. Drums or containers used in fueling must be removed from the proximity of other drums. To prevent the accumulation of static electricity, which could cause a spark, hose nozzles for gasoline fueling are provided with a connection for grounding on the tank. This grounding device must not be disconnected until after the nozzle is withdrawn.

SHIP'S HANDLING CHARACTERISTICS

As a line officer you will probably stand many watches underway as either conning officer or OOD. To be qualified in these roles you must understand your ship's handling characteristics, under most types of loading and under any sea conditions. This experience has great value to personnel on deck engaged in any one of the many seamanship evolutions, even though most deck personnel do not consciously recognize the cues given to them by the way the ship feels, but they are aided by them. It helps them to anticipate and correct for sudden changes in the ship's movements. Knowing what the ship is going to do is of great help to deck personnel during such standard evolutions as launching the motor whaleboat and recovering it. Knowing how the ship is going to react to rudder orders when it is loaded a certain way and the seas are running a certain direction helps winch operators and line handlers to make the launch or retrieval at the right moment after the orders have come down to do so.

That ship's handling characteristics affect the time involved in hooking up or breaking away during underway replenishment is more or less obvious. For example, when the conning officer has the ship in a position too far out and too much ahead, this can be corrected by steering slightly toward the replenishing vessel and perhaps even dropping turns. The ship will close, but as this happens the angle made by highlines or other rigs changes radically, making work extremely difficult for personnel hooking up or trying to operate the rigs. Of course, these same personnel are aided by the cues that the ship's motion gives them, and thus are usually able to anticipate such movements and compensate for them.

Just what is the importance of recognizing the interrelationship between the ship's handling characteristics and deck evolutions? Once again, it is an aid to planning. Although the manning of stations for the particular details is prescribed by one of the ship's bills, the exercise of that particular evolution can be made more difficult or easier depending on the weather. Knowing beforehand approximately how the ship is going to act allows you to estimate the personnel requirements needed to meet that particular situation. It allows you to plan the shifting of personnel from station to station, if that is what is needed, ahead of time and without confusion. In short, it allows you, your first lieutenant, and your petty officers the greatest flexibility that is needed to meet any situation with the greatest efficiency in both personnel and overall operation.

HELICOPTER OPERATIONS

Helicopter operations are not new to the fleet, but in recent years have had new applications and implications for the nonaviation class of ships. In this section we will cover helicopter refueling, both in flight and on deck, vertical operations. The coverage in this section will not be extensive; this is a highly complex area, and there are a multitude of references available.

The first thing you must bear in mind is that in refueling aircraft you are working with hydrocarbon fuels, one of the JP series. These fuels can give off a highly volatile vapor, which, being heavier than air, will tend to settle toward the deck and collect in low spots, such as the trunk area on a helicopter deck. When combined with air in the proper proportions, fuel vapor forms an explosive mixture. This mixture can be ignited by the discharge of static electricity, by sparks from tools, or by other sources. The result will be a violent explosion.

All fire precautions must be observed during the fueling process, whether this takes place on deck or in flight. Smoking is not permitted in the area, nor is the exposure of naked lights (such as are produced by lighters, matches, exposed electric switches, sliprings or commutators, a dynamo or motor, and spark-producing electrical equipment, or any burning material). Lights other than explosionproof lights are not to be permitted within 100 feet of these operations. No light of any sort at all can be placed where it may come in contact with spilled fuel. All accidentally spilled fuel or other combustible liquids must be immediately removed by washing with water and be covered with a foam blanket to prevent ignition, or neutralized by other means.

CAUTION: The fuel tanks should not be filled to the top whenever a helicopter is to be stowed in the hangar if the outside temperature is cooler than the inside temperature. If it is warmer inside the hangar than it is outside, the fuel in the tanks will expand and cause overflow through the tank's venting system, thus causing a fire hazard.

Nonspark tools must be used when work is being done on any part of a system or unit designed for storing or handling combustible liquids.

All fuel is filtered and passed through separating equipment before it is pumped into the tanks. When necessary to filter the fuel externally, do not use a chamois filter to accomplish this. Chamois filters will increase the danger of static electricity.

During fueling operations, or flight quarters, there should be personnel standing by with CO_2 fire extinguishers and hoses with applicators laid out. If refueling on deck, you must ensure that the helicopter is grounded to the deck and the nozzle is grounded to the helicopter. Ensure that personnel involved in the operation are not allowed to continuously breathe the vapors present during these operations, as they are highly toxic and will cause dizziness or sickness. If personnel have their clothing saturated by accidental spillage or by other means, ensure that they immediately remove such clothing and thoroughly wash with soap and water all parts of their bodies exposed to the fuel. Wearing saturated clothing presents an extreme fire hazard and can produce painful blisters on the skin. Try to avoid getting fuel in the eyes but, if this does occur, seek immediate medical attention.

- Helicopter inflight refueling (HIFR). HIFR has become commonplace and has increased the helicopter's capabilities. All HIFR ships should be equipped with the Wiggins quick-disconnect fueling rig that allows them the rapid emergency breakaways. For additional information, refer to NWP 42, *Shipboard Helicopter Operating Procedures*.

- Refueling on deck. Pressure refueling with the aircraft shut down is the normal procedure for refueling a helicopter. The aircraft will be completely shut down, and only the aircrew, refueling party, and fire party should remain on station. Additional information on pressure refueling can be found in the applicable aircraft NATOPS flight manual. Of major concern with helicopter refueling are the DDs and FFs with LAMPS capabilities. The larger ships (aircraft carriers) normally have ABFs aboard to handle the fueling of aircraft.

- Equipment for fueling DDs and FFs is in a kit form; it includes all items required for fueling. The aircrews perform all refueling of helicopters.

FLIGHT QUARTERS

Depending on the contemplated operation, flight quarters for helicopter operation may take one of several forms. You will, most likely, be responsible for drawing up ship's instructions to cover these possible operations.

The two tactical publications governing ship/helicopter operations are *Replenishment at Sea*, NWP 14, and *Helicopter Operations*, NWP 32. They are both distributed through the Naval Warfare Publications Library. The latter publication covers helicopter operations and procedures for employment of helicopters with nonaviation ships. On combatant-type ships, the weapons officer is primarily responsible for overseeing these operations, and on noncombatant ships, the first lieutenant has these duties.

VERTICAL REPLENISHMENT (VERTREP)

Although vertical replenishment as a subject should be covered in the section on underway replenishment, it will, because of its uniqueness, be mentioned here. It can be used on any ship type during the daylight hours, but there are certain restrictions placed on vertical nighttime replenishment. Routine night VERTREP while underway should be used only for delivery to:

- CV/CVN/LPD

- AOE, AFS

- Any type of ship that has a flight deck permanently equipped with proper night lighting features.

In an emergency situation, most ships can be replenished at night if adequate lighting is available. The final decision on whether a ship should be replenished at night under existing conditions will be left to the pilot. This decision cannot always be made until after the pilot sees the ship's lighting after dark. Night VERTREPS should be conducted only if all requirements listed in NWP 14 are followed.

Preparation, organization, and safety are vital to all shipboard evolutions, but to those inexperienced in aircraft operations, as most nonaviation types are, these factors are only a beginning. A continual awareness of what can and will happen through one careless or reckless act is mandatory. VERTREP safety procedures must be meticulous and instinctive.

For example, any movable object near the drop area that is not properly secured can become a missile hazard. Rotor wash will pick up rags, hats, empty boxes, canvas covers, and even 40- by 48-inch wooden pallets. Rotor wash has been known to lift papers, pencils, and cigarettes out of crew members' pockets near the drop area and deliver them intact to the air intake of a turbine engine. Small items can slip through the engine's protective screen and cause damage that can result in loss of the aircraft, possibly in a crash on deck.

NWP 14, *Replenishment at Sea*, and NWP 32, *Shipboard Helicopter Operating Procedures*, contain the operational and safety procedures applicable to both the receiving and delivering ships during VERTREP. These procedures must be followed by each person involved with the operation if it is to be accident free. Reports, however, make it clear that some shipboard personnel seldom, if ever, see these publications.

To better understand the safety procedures involved with VERTREP, a brief description of a helicopter is in order. Since the CH-46 Sea Knight is the most widely used VERTREP aircraft, we will discuss it.

The tandem rotor blade configuration of the CH-46 allows it to be used with more flexible wind-over-the-deck conditions than those required for the main-rotor-plus-tail-rotor aircraft, such as the H-2 or H-3. It is powered by two jet engines, weighs about 12,000 pounds completely empty, and carries 380 gallons of fuel. Under ideal conditions, this aircraft can lift 6,000 pounds of external cargo. However, the normal cargo load during VERTREP is between 2,000 and 4,000 pounds.

The rotor blades, rotor wash, and noise create the most serious hazards to shipboard personnel. The blade tips travel near the speed of sound and should they strike an object, the blades could shatter and spray the area with shrapnel.

The rotor wash can sweep the drop area with winds near hurricane velocity, and the combination of jet engines and rotor wash creates a deafening noise. Prolonged exposure to the noise without protective devices can damage the hearing of personnel near the drop area.

SAFETY PRECAUTIONS/SHIP HELICOPTER OPERATIONS

NWP 14 and NWP 32 list the detailed safety precautions for ship/helicopter operations. Based on NAVSAFECEN discussions with helicopter pilots, the most frequently violated safety precautions are reemphasized below:

- A green light, 12 by 18 inches, will be displayed near the drop area if the ship is ready to receive the helicopter; a red light will be displayed when the ship is not ready.

- A landing signal enlisted (LSE) should be standing by to direct the helicopter. To ensure that visual contact is maintained, the LSE must be able to see the pilot's eyes. The aircrewman, who is directly over the load and controls hookups and drops, is the primary director of the helicopter once it is in a hover over the drop area. The LSE, however, must continue giving directions in case of internal communications failure or other emergencies. Only the designated LSE should be giving signals at any one time.

- Clear the cargo handling area of obstructions; cover and pad any fixed fittings; depress gun barrels and train them on the beam; unstep flagstaffs and lower all safety nets. All removable objects, which might be damaged by swinging loads, should be removed from the area and all hatches and scuttles near the drop area are to be closed.

- Clear and secure all loose gear near the drop area, including canvas covers and trash. Ensure that large, relatively light objects, such as empty boxes, sheet metal, and plywood, are tied down or removed from the areas affected by the helicopter rotor wash.

- Everybody, except the LSE and the hookup personnel, when required, must clear the drop area during a delivery.

- The LSE and hookup personnel should wear only authorized, properly secured flight deck clothing, such as hardhats with goggles and ear protectors, jerseys, safety shoes, and lifejackets. This clothing will provide them with confidence and protection. Flight deck personnel should have empty pockets. (Cargo handlers in the vicinity should also wear ear protection to prevent hearing damage.)

- Those stationed at the receiving area should be trained to take cover immediately on command of the officer or petty officer in charge.

- All hands working in the vicinity should be instructed to observe the aircraft carefully for any sign of malfunctions, such as smoke, oil, hydraulic leaks, and so forth, and immediately report such conditions to the officer in charge.

- Ships participating in helicopter operations should have a firefighting detail stationed at the receiving area. One 2 1/2-inch charged hose should be available in the immediate vicinity. In addition, there should be two 15-pound CO_2 fire extinguishers stowed near the delivery area on each side. Assigned firefighters should be properly clothed and are not assigned to any other duties.

- All hands should be instructed concerning the shrapnel effect caused when rotor blades strike a solid object. Spectators must be kept clear of the receiving area while VERTREP is in progress.

- Cargo handlers should not attempt to steady a load or rush to the load before the helicopter has left the drop area.

- Ships should be careful not to blow tubes or dump trash and garbage during VERTREP operations.

- All staging and drop areas, and the paths leading to them, should be covered with a deck surface that reduces the danger of slipping and falling during wet weather or rough sea.

VERTREP is a complex operation, and the selection of key personnel to direct the various stages of the operation is paramount. In this regard, ships face a more serious problem since the crew is usually not familiar with helicopter operations.

Each ship is configured differently and has its own individual problems when conducting helicopter operation. NAVSAFECEN recommends that ships without aviation personnel have at least one officer and one qualified LSE aboard who have attended a school conducted by HC-5 or HC-6 (helicopter combat support schools).

Further information on the subject of VERTREP is obtainable by reference to the two tactical publications already mentioned. The key to successful VERTREP is the removal of dropped material from the receiving area in a smooth continuous flow. This, perhaps, is the most difficult problem that must be solved. The solution to the problem is directly related to the deck space layout of the receiving ship and the intelligent routing of goods received throughout this space.

PLANE GUARD AND RESCUE DETAILS

Type commander's standard organization manuals usually have standard bills that can be reworked with minimum change to fit two major categories of shipwide evolution. For instance, when the ship is assigned plane guard station, the Man Overboard Bill, without the muster of the personnel requirement and some additions to the equipments needed at the various stations, fits the situation nicely. One other change to be made is the organization of the personnel into watch sections, on a reduced manning level, when the ship is assigned a more or less continuous plane guard station on a rotating basis with other ships of the group. One item of significance is that swimmers must be qualified by following type commanders' instructions. Requalification is required each year. Other instructions list what requirements must be met by individual ships prior to deployment with a CV task group.

For more information on plane guard and rescue operations, refer to ATP 1, *Allied Maritime Tactical Instructions and Procedures*.

UNDERWAY REPLENISHMENT

The primary aim of underway replenishment is safe delivery of the maximum amount of cargo in the minimum amount of time.

Two major references that you should be familiar in this area are *Replenishment at Sea*, NWP 14 (the basic replenishment doctrine for U.S. Navy ships), and *Replenishment at Sea*, ATP 16 (the basic replenishment doctrine for ships operating in a NATO force). These documents are generally similar in content. The basic fleet operations orders may contain additional operational information directly related to the replenishing function. Fleet and type commander's instructions and notices are another source of doctrine. In this portion of the chapter we will cover some of the basics in regard to rigs and other matters, but will leave most of the information to the basic publications and references.

Many features are common to all replenishment operations and they will be discussed first.

It is the responsibility of the officer in tactical command (OTC) to select a suitable course and speed, taking into consideration the mission of the group and the condition of the sea.

Generally, the delivering ship takes station, and the receiving ship maneuvers to come alongside and adjusts course and speed as necessary to maintain position during the operation.

The delivering ship fires the gun lines to all types of receiving ships except carriers. The danger inherent in firing gun lines into the lower decks of carriers, where supplies are received, makes it necessary for carriers to fire the gun lines to the delivering ships.

Except for the receiving ship's Burton whip and gear actually rigged on the receiving ship, such as fairlead blocks and riding lines, the delivering ship furnishes all the equipment. Other exceptions are that when carriers and cruisers are alongside replenishment ships and personnel are to be transferred, the CVs and CAs must furnish and tend the highline, and all receiving ships supply and tend the phone and distance lines.

The zero end of the distance line is secured at or near the rail of the delivering ship, and the other end is tended on the receiving ship.

Each station on both ships has a telephone talker, and also a signalman who is familiar with the prescribed signals. Necessary commands are transmitted by telephone, the primary means of communication, but they also must be given by hand or light signals. It is a good idea to post the hand signals at the replenishment stations or to stencil them on the backs of the paddles.

FUELING AT SEA

Fueling at sea can be conducted by using either of the accepted rigs—close-in or span wire. The choice is governed by the kind of ship delivering the fuel and the conditions under which replenishment is made. The close-in and the span wire rigs differ mainly in the method by which the hose is extended to the receiving ship.

Fleet oilers and many of the major combatant ships are provided with installations necessary for transferring fuel by the span wire method. Other ships equipped to transfer fuel must do so by the close-in method.

The hose in the close-in method of rigging is supported by boom whips and bight lines, which lead from saddles on the hose to booms or other high projections on one or both ships. When the rig is used to fuel a large ship, the hose may be supported also by an outboard bight line led from the outboard saddle to a high point on the receiving ship.

Of the two methods, the span wire method is preferred because it permits greater ship separation. The choice is governed by:

- Rig availability and design characteristics of both delivery and receiving ships

- Existing weather and sea conditions

Standardization in rigs and in their use assists ships in fueling expeditiously. Some deviations from standard rigs may be necessary to conform with the design features of particular ships, but such deviations should be kept to a minimum.

End Fittings

End fittings are used on the ends of refueling hoses. There are several types, namely, the breakable-spool quick-release coupling (NATO), the combined quick-release (Robb) coupling and valve, and the fueling probe.

- Breakable-spool quick-release coupling (figure 7-8). The breakable-spool quick-release coupling consists of an A-end and a B-end. The A-end, rigged on the receiving ship, simply is a cast-iron spool with a standard hose flange on one end and a slotted flange on the other. A groove machined around the spool weakens it sufficiently to permit its being easily broken in an emergency by a blow from a sledge hammer.

The B-end is a similar spool with a standard hose flange on one end and a special floating-ring flange with drop bolts on the other. The floating-ring flange can be rotated to quickly bring the drop bolts in line with slots in the A-end.

A gasket mounted in the outboard end of the B-end ensures an oil-tight fit. A blank flange is attached to the B-end when the hose is being passed to prevent oil from spilling and water from entering the hose.

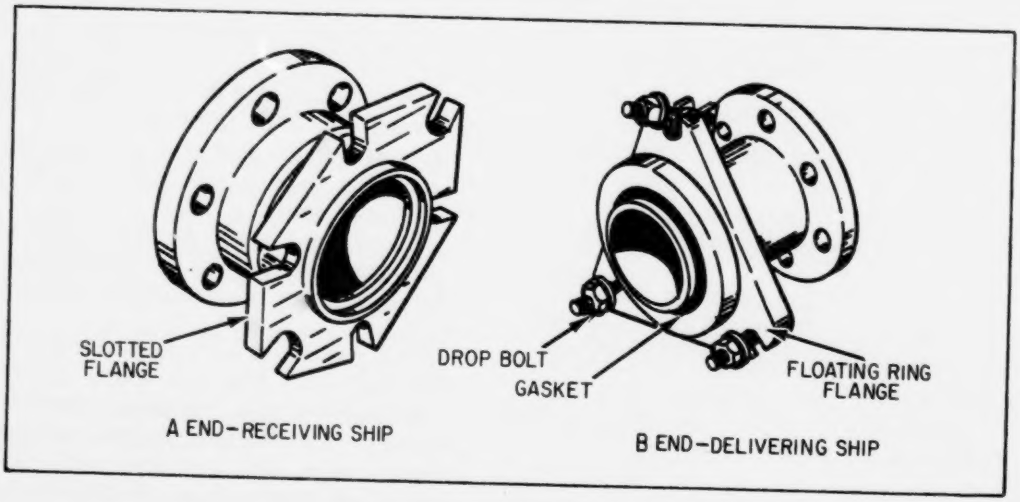

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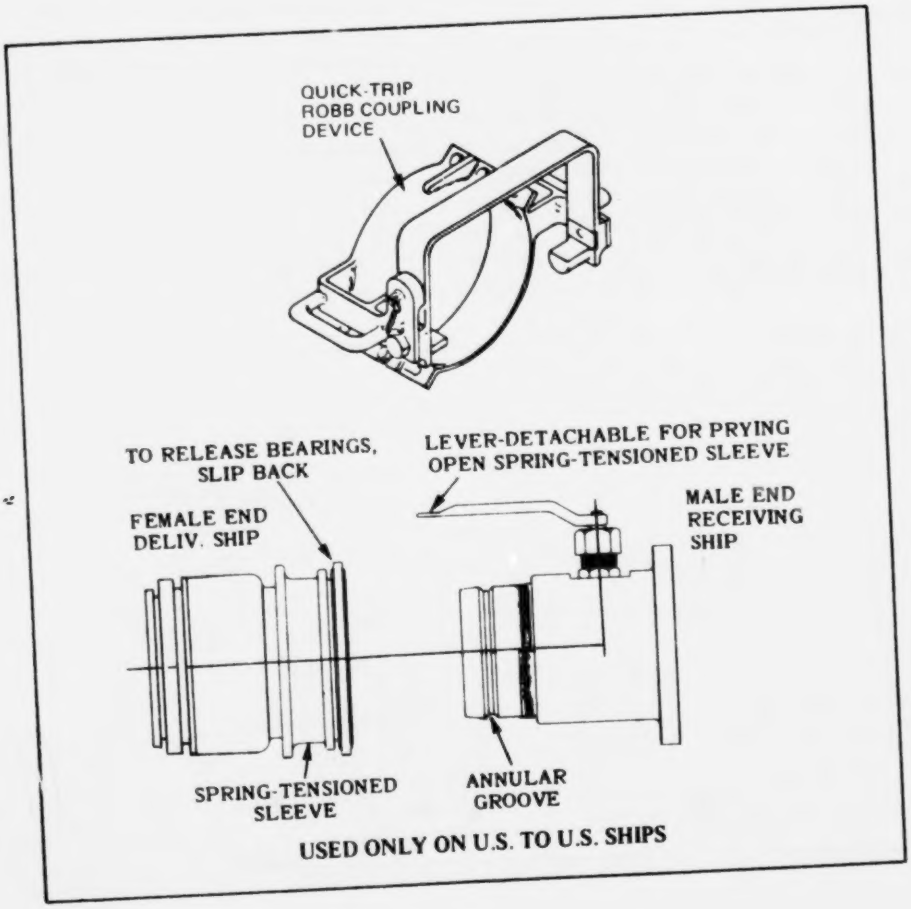
Figure 7-8.—Breakable-spool quick-release coupling.

- Combined quick-release coupling and valve (figure 7-9). The combined quick-release (Robb) coupling and valve consists of a female and a male end. The male end, rigged on the receiving ship, is a slightly tapered tube with a flange at one end. Near the other end is a machined groove. A spring-tensioned ball race in the female end lines up with the groove, and a spring-tensioned sleeve on the outside forces the balls down into the groove, holding the two ends together. When the sleeve is forced back by hand or, as usually is necessary, by pry bars, tension on the ball race is released and the male end can be withdrawn. Slots are cut into the sleeve to permit inserting pry bars between the sleeve and the end ring.

A valve, located in the female end, normally is closed and held in place by a heavy spring. A gasket ensures a tight seal. Another gasket provides a tight joint when the two ends are joined. A ring-shaped actuating cam in the male end is linked to an operating lever. When the lever is turned to the OPEN position, the cam is thrust forward, opening the valve. Both 6-inch and 7-inch flanges are available for the female end; therefore, the coupling can be used with either size of hose.

Despite the name, the Robb coupling does not qualify as a quick-release device, because uncoupling is ordinarily difficult and is impossible when the fitting is under strain. For this reason, any strain must be taken by the riding line, and to connect or disconnect, the ends must be perfectly lined up. To provide for emergency breakaway, a breakable spool is inserted between the receiving ship's manifold and the male end.


QUICK-TRIP
ROBB COUPLING
DEVICE
TO RELEASE BEARINGS, SLIP BACK
LEVER-DETACHABLE FOR PRYING OPEN SPRING-TENSIONED SLEEVE
FEMALE END
DELIV. SHIP
MALE END
RECEIVING
SHIP
SPRING-TENSIONED SLEEVE
ANNULAR GROOVE
USED ONLY ON U.S. TO U.S. SHIPS

63.99

Figure 7-9.—Combined quick-release (Robb) coupling and valve.

- TERMINAL HOSE.—To fuel destroyers, it is necessary to shift from the 6- or 7-inch hose to a 4-inch hose. The quick, easy method used is as follows:

To a 10- or 30-foot length of 4-inch hose is attached a male end of a Robb coupling. If the 4-inch hose (pigtail) is 10 feet long, a single hose clamp is attached to the hose 1 foot from its inboard end. If the pigtail is 30 feet long, hose clamps are attached 9 and 13 feet from the outboard end. A 3/4-inch stress wire spans the distance between the 4-inch clamps and the outboard one on the large hose.

When it is necessary to shift to the pigtail, the Robb fitting is coupled together and the stress wire shackled in place. The operating handle is lashed or otherwise secured in the OPEN position, and a cap is screwed onto the pigtail to keep oil from spilling and water from entering the hose.

Probe Fueling System

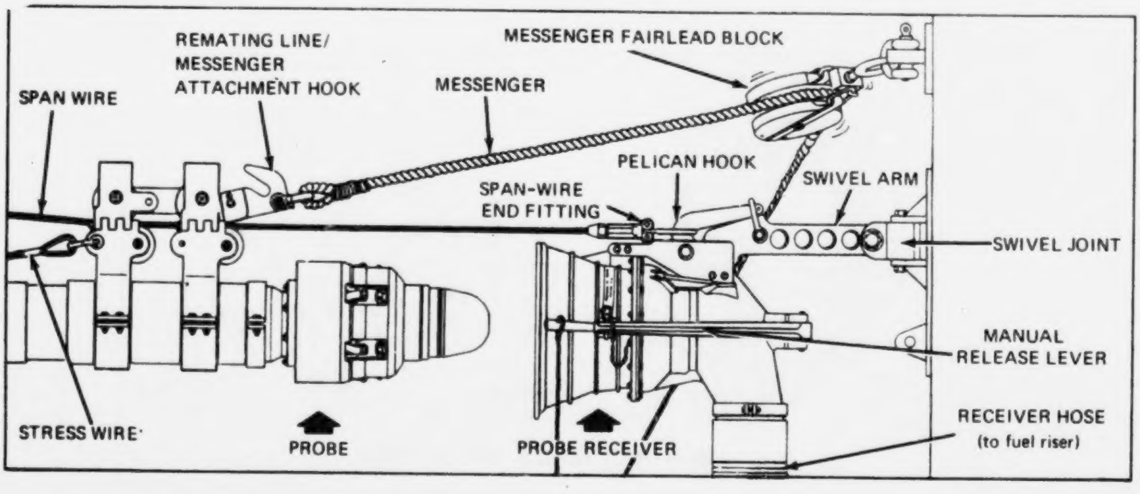
The probe fueling system (figure 7-10) was one result of the Navy's efforts to reduce alongside time in replenishment operations. The system comprises two parts, a male probe attached to the end of the oiler's 7-inch hose and a receiver supported by a swivel fitting mounted on the receiving ship. A pelican hook for securing the span wire is an integral part of the swivel fitting. Although the span wire may or may not be tensioned, this arrangement keeps the receiver aligned to take the probe.

The probe incorporates a sliding sleeve valve that opens when the probe is engaged properly and closes automatically when disengaged. Visual indicators mounted on either side of the receiver show when the probe is seated. As the probe is mated, the indicators rise to the vertical, then drop back to a position approximately 30° above the horizontal. When the probe is engaged properly, a latch mechanism prevents its being withdrawn under normal circumstances until it is disengaged by a pull on a lever mounted on the receiver. A pull of about 2,500 pounds on the inhaul, however, will disengage the probe.

The span wire and other lines of the probe fueling rig are passed in the same manner as for other rigs.

When ship separation is 140 feet or less, the delivery ship end of the span wire (the probe) is high enough to permit the probe to slide down the span wire to the receiving ship. With the inhaul, the winch operator stops the probe several feet short of the receiver to prevent the probe from slamming into the receiver and breaking something. Then, personnel on the receiving ship attach a remating line to the outboard trolley. A pull of from 300 to 350 pounds on the remating line will seat the probe.

With ship separation greater than 140 feet and at all times when refueling aircraft carriers, an



58.166

Figure 7-10.—Single probe and receiver.

outhaul must be used because the catenary of the span wire is such that the last few are uphill. Depending upon the fairled arrangement, we recommend that five to eight crew members be used on the outhaul or remating line.

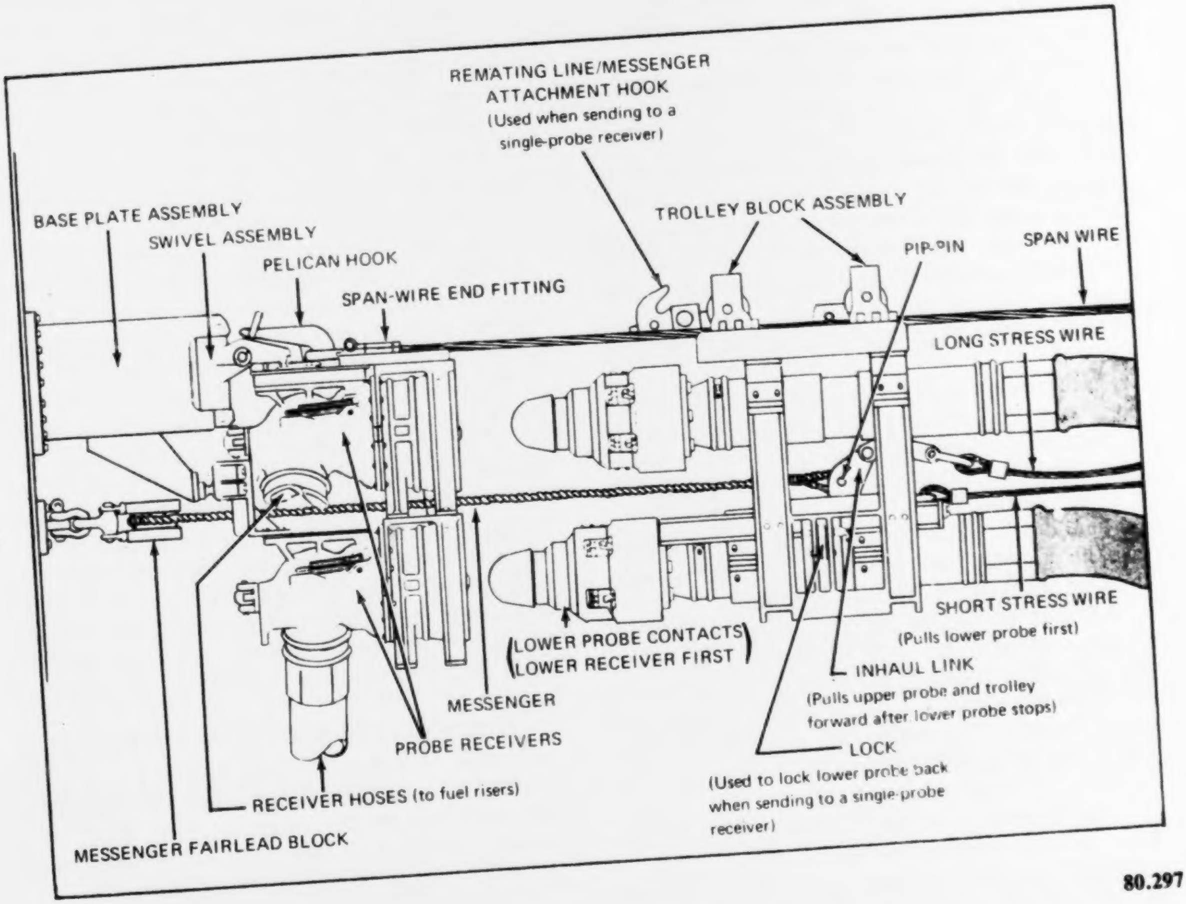
The double probe is used as part of the double-hose rig. Currently, only carriers can be refueled with the double-probe method, but it can be used by two oilers to consolidate their loads.

The double probe consists of two single probes suspended from a trolley block assembly (figure 7-11). The messenger is shackled to an eye located between the hoses in the trolley block assembly with a pip-pin.

Astern Fueling

The astern fueling method normally is not employed by the U.S. Navy. Agreements between NATO nations, however, require that all escort-type vessels be capable of receiving fuel from designated merchant tankers by both the alongside and astern methods. Astern fueling has the advantages of simplicity and ruggedness of equipment and adaptability of the rig to all the different types of escort vessels, whereas, the alongside method is superior in connecting up, passing fuel, and disconnecting the rig.

There are some variations in the astern fueling method, but they all, more or less, resemble each other. Briefly, the rig consists of a towed marker buoy, twenty 30-foot sections, and one 15-foot section of 6-inch buoyant fuel hose. The receiving ship moves up the quarter of the delivering ship where a shot line and hose messenger are passed to the receiving ship. The delivery ship immediately pays out the fuel hose as the receiving ship drops back until its bridge is opposite the marker buoy. The receiving ship then hauls aboard the discharge end of the hose.


REMATING LINE/MESSENGER
ATTACHMENT HOOK
(Used when sending to a single-probe receiver)
BASE PLATE ASSEMBLY
SWIVEL ASSEMBLY
PELICAN HOOK
SPAN-WIRE END FITTING
TROLLEY BLOCK ASSEMBLY
PIP-PIN
SPAN WIRE
LONG STRESS WIRE
SHORT STRESS WIRE
(Pulls lower probe first)
LOWER PROBE CONTACTS
LOWER RECEIVER FIRST
INHAUL LINK
(Pulls upper probe and trolley forward after lower probe stops)
MESSENGER
PROBE RECEIVERS
LOCK
(Used to lock lower probe back when sending to a single-probe receiver)
RECEIVER HOSES (to fuel risers)
MESSENGER FAIRLEAD BLOCK

80.297

Figure 7-11.—Double probe and receiver.

Returning the hose to the delivery ship is the reverse of passing it to the receiving ship.

All of these fueling methods are described in detail, including safety precautions to be observed while fueling, in both NWP 14 and ATP 16. They will not be described further in this chapter.

STORES

The wire highline method of transfer uses a highline traveled by a trolley. The highline extends from a winch on the delivering ship through a block on a boom head and across to the receiving ship's pad eye. The trolley is moved toward the receiving ship by either a wire or a manila outhaul line and is brought back to the delivering ship with a winch-operated wire inhaul line.

Use of the wire highline is standard procedure in transferring cargo to destroyers and other small ships. At times (for example, when the total amount is small), it also is the best means of transferring cargo to large ships.

To make sure of a wire highline, the receiving ship must have a high attachment point of sufficient strength and for which a shipyard test data plate has been mounted. There must be another pad eye of 1-inch diameter stock located directly below and about 12 to 18 inches from the first pad eye. This supports the block used to fairlead the outhaul line. Finally, sufficient deck space is needed in the vicinity of the stores handling area to handle the supplies coming aboard.

Normally, loads are limited to 800 pounds—an amount considerably less than is possible either in burtoning or house-falling. If the receiving ship has a highline fitting tested to 16,000 pounds or a combination fitting (for both highline and outhaul block) tested for a working load of at least 25,000 pounds, then loads up to 3,500 pounds may be transferred by wire highline.

On the delivering ship a boom is used to obtain a satisfactory lead for the wire highline, but any other point of suspension on the ship's structure will serve as well if it is high enough and strong enough. The description that follows deals with a boomrigged highline. Other adaptions can be made on individual vessels.

The highline is at least 350 feet of 3/4-inch wire (6 × 31 high-grade plow steel) with a thimbled eye on its outboard end. The other end is rove through a trolley block, through the head and heel blocks of the boom, and then spooled onto a winch drum. A 1 3/8-inch pelican hook is secured to the thimbled eye with a 7/8-inch shackle.

The wire inhaul line is shackled to the inboard side of the trolley, rove through a block just below the head block, and fairled to a winch. If the outhaul also is wire, it is shackled directly to the outboard side of the trolley. If the outhaul is manila, a 24-inch wire pendant is inserted between the trolley and the outhaul. The outboard end of the outhaul is secured to a messenger. A 2-fathom steadying line also is attached to the trolley.

The boom is positioned so that the trolley will plumb the loading point. A preventer leads from the inboard side of the boom head to a fitting provided on the deck or the bulwark.

If a second boom is to be used to remove cargo from the hold, it is rigged to as a single swinging boom.

Because a trolley block riding on a highline running through the head block of a boom rigged over the side is difficult to bring within reach, many BMs rig some device to haul down the trolley block. One simple method is to fairlead the inhaul through a block inboard and farther down than the one normally used at the head of the boom. By slacking off on the highline and heaving around on the inhaul, the trolley block then can be hauled within reach.

On the receiving ship, little preparation is necessary in the highline method. Below the highline pad eye is secured an 8-inch snatch block for the outhaul line. Other blocks are rigged, as necessary, to fairlead the outhaul line to a winch (wire overhaul) or to an area where several crew members can haul on the line (manila outhaul).

There are various ways of rigging the delivering ship for the transfer of cargo by the Burton method (figure 7-12). Normally, the boom to the engaged side is used for the actual transfer, and the boom on the opposite (or unengaged) side is employed to hoist loads from the hold. This method is the most efficient way of transferring cargo by the Burton method when only one set of booms and winches is available at the active hatch.

Burton ships are 6 × 37 or 6 × 31 high-grade plow steel wire rope, 3/4 inch in diameter and 350 to 600 feet long. One is tended on the delivering ship and one on the receiving ship. Each ship usually furnishes its own whip, but in some cases the delivering ship may furnish both.

The success of a replenishment operation is determined, in part, before you ever reach the delivery ship; it is decided by how well you are

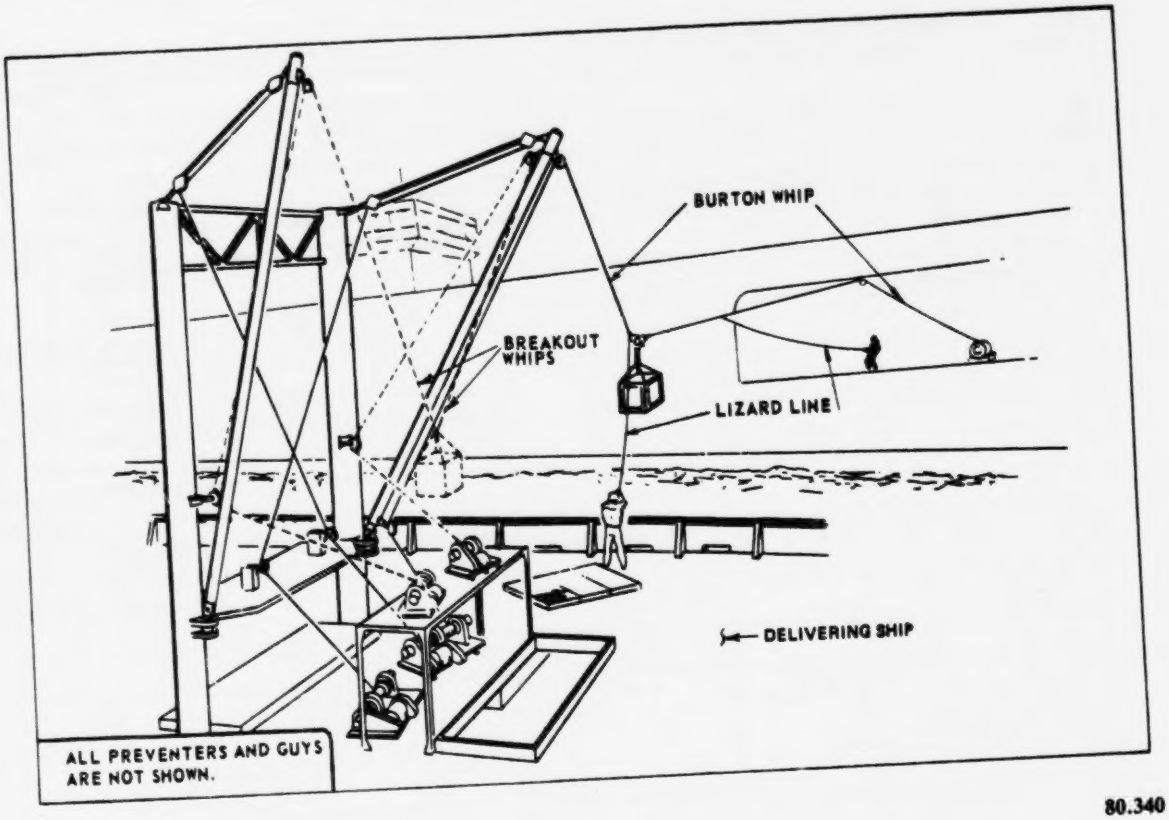


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Figure 7-12.—Burton rig.

prepared for the job ahead. Indeed, proper preparation is so important that you should not trust memory alone in getting ready. To avoid oversight, it is best to follow a carefully prepared checkoff list. Checkoff lists vary depending upon the replenishment method or methods to be employed.

In training your personnel in replenishment operations, remember that although speed is highly important, safety must never be sacrificed for speed. Since it is impossible to anticipate all of the hazardous situations that may arise, personnel assigned to transfer stations should be instructed in all phases of safety procedures and precautions.

TRANSFER OF PERSONNEL AT SEA

The manila highline is rigged similarly to the wire highline discussed briefly above. It is used for light freight transfers and is the only rig authorized for personnel transfer at sea. Personnel may also be transferred by boat or helicopter.

The first three of the following statements are mandatory when personnel are being transferred at sea by rig.

1. Only manila lines may be used. Neither wire nor nylon is authorized for personnel transfer. Also, manila lines that have ever been tended from a gypsy head must not be used for personnel transfer.
2. A shackle (5/8-inch or larger) is used to secure the highline to the attachment point. A pelican hook may not be used.
3. All lines—highline, inhaul, and outhaul—must be tended by hand. Lines may not be spooled on capstans or winches.
4. Have the highline rigged and ready for use to port or starboard; see that all lines are faked down clear for running.
5. Break out transfer bags and have them ready.
6. Break out the personnel transfer chair, and check to be sure that the link and jaw swivel is attached.

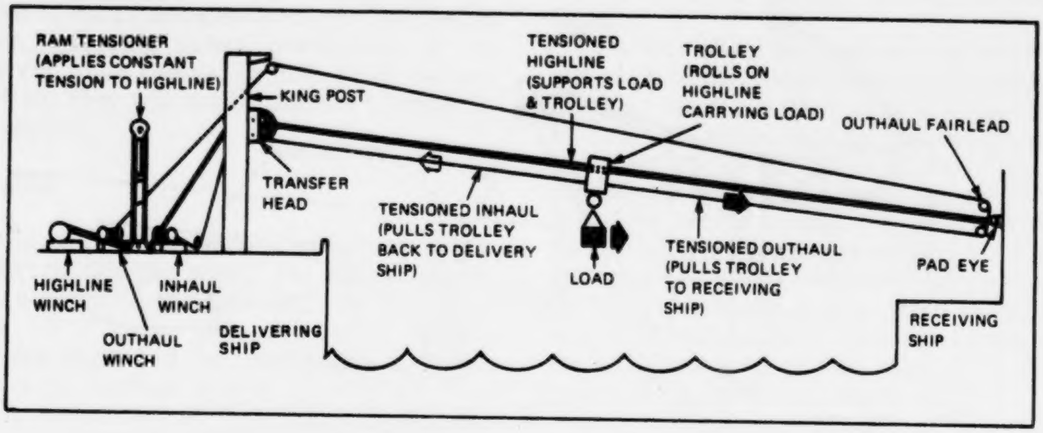
RAM TENSIONER (APPLIES CONSTANT TENSION TO HIGHLINE)
KING POST
TENSIONED HIGHLINE (SUPPORTS LOAD & TROLLEY)
TROLLEY (ROLLS ON HIGHLINE CARRYING LOAD)
OUTHAUL FAIRLEAD
TRANSFER HEAD
TENSIONED INHAUL (PULLS TROLLEY BACK TO DELIVERY SHIP)
LOAD
TENSIONED OUTHAUL (PULLS TROLLEY TO RECEIVING SHIP)
PAD EYE
HIGHLINE WINCH
INHAUL WINCH
OUTHAUL WINCH
DELIVERING SHIP
RECEIVING SHIP

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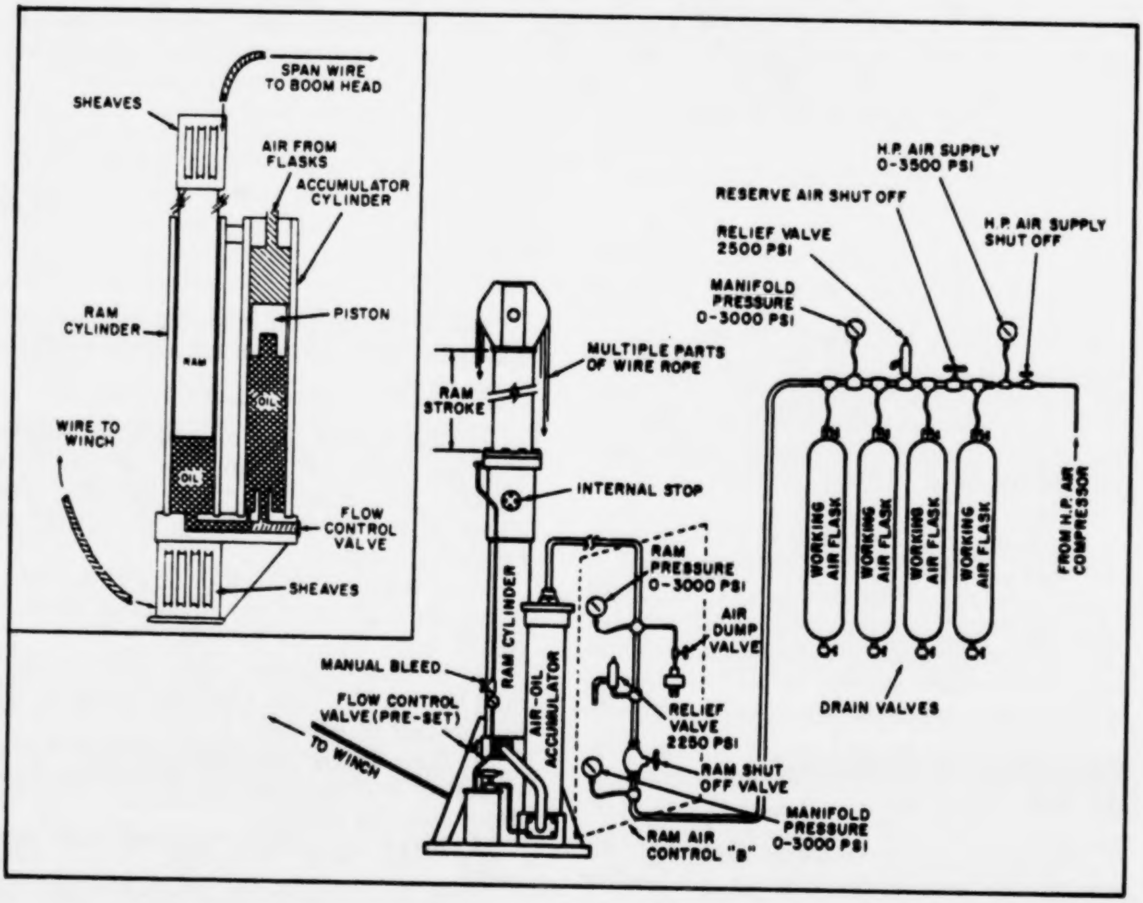
Figure 7-13.—Missile/cargo STREAM rig.


SPAN WIRE TO BOOM HEAD
SHEAVES
AIR FROM FLASKS
ACCUMULATOR CYLINDER
PISTON
RAM CYLINDER
RAM
OIL
OIL
WIRE TO WINCH
FLOW CONTROL VALVE
SHEAVES
H.P. AIR SUPPLY 0-3500 PSI
RESERVE AIR SHUT OFF
H.P. AIR SUPPLY SHUT OFF
RELIEF VALVE 2500 PSI
MANIFOLD PRESSURE 0-3000 PSI
MULTIPLE PARTS OF WIRE ROPE
RAM STROKE
INTERNAL STOP
WORKING AIR FLASK
WORKING AIR FLASK
WORKING AIR FLASK
WORKING AIR FLASK
FROM H.P. AIR COMPRESSOR
RAM PRESSURE 0-3000 PSI
AIR DUMP VALVE
RAM CYLINDER
AIR-OIL ACCUMULATOR
MANUAL BLEED
FLOW CONTROL VALVE (PRE-SET)
TO WINCH
RELIEF VALVE 2250 PSI
DRAIN VALVES
RAM SHUT OFF VALVE
MANIFOLD PRESSURE 0-3000 PSI
RAM AIR CONTROL "B"

58.42

Figure 7-14.—Ram tensioner.

7. Rig the green provision marker on port or starboard sides.

8. Have the light line with the sea bag ready for transfer of small articles, movies, or guard mail.

9. Break out orange inherently buoyant lifejackets for use by personnel being transferred in the transfer chair.

SPECIAL RIGS

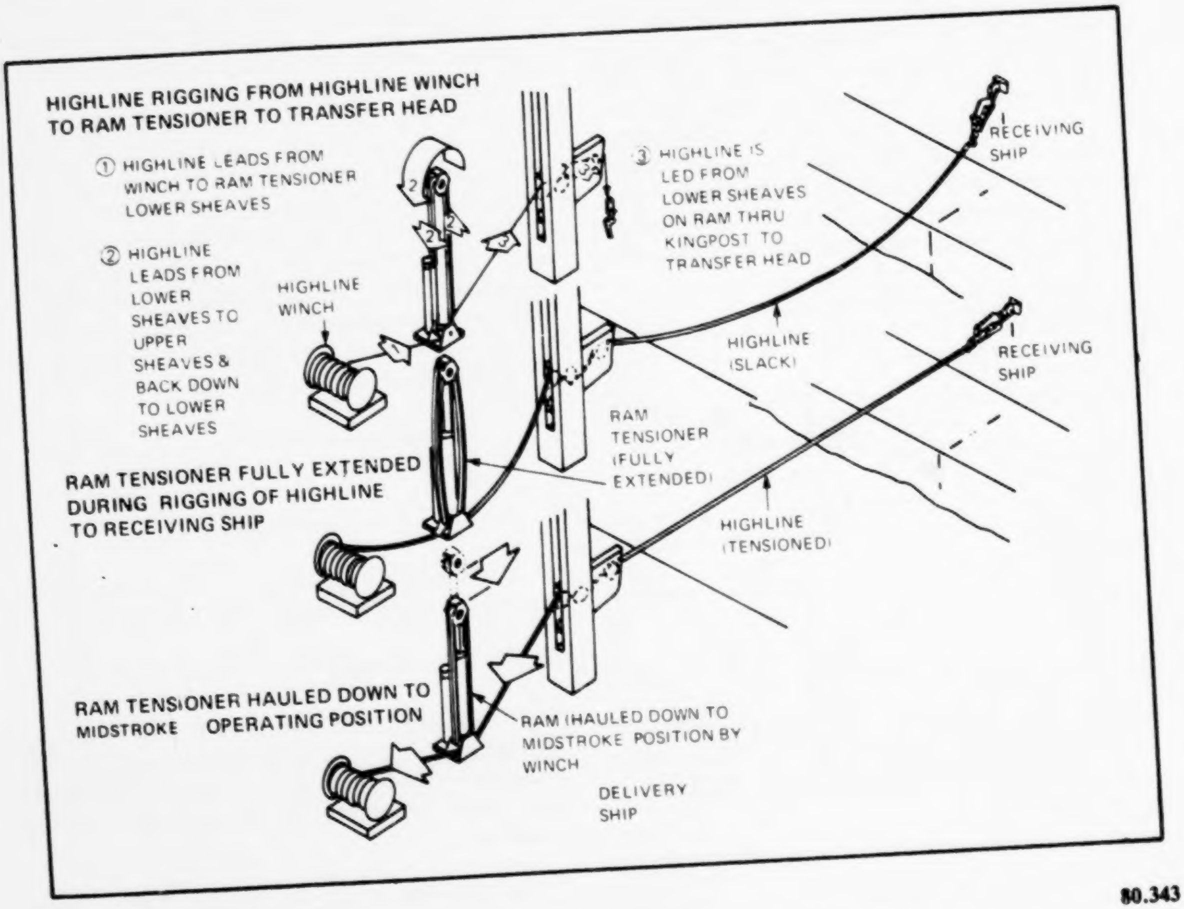
The coverage in this section is intended to round out the average line officer's knowledge of rigs that are not generally used. Some, such as the STREAM system (formerly FAST), are relatively new and are not installed on all ships. Others, towing and sweeping mines, have special classes of boats or ships whose primary employment is in these areas.

Standard Tensioned Replenishment Alongside Method (STREAM)

The standard tensioned replenishment alongside method (STREAM) actually is not a single method but a combination of transfer systems. The only common feature of this combination is in the use of a ram tension highline.

Most of the STREAM equipment is installed aboard the delivering ship. Figure 7-13 shows a typical missile/cargo STREAM delivering rig. The winch and ram tensioner apply pressure to the highline, which supports the trolley block. A closeup view of the ram tensioner is shown in figure 7-14. The trolley block is moved between ships by varying the tension on the inhaul and outhaul lines, which are on a separate winch.

A diagram showing the highline rigging from the highline winch to the ram tensioner to the transfer head is shown in figure 7-15.


HIGHLINE RIGGING FROM HIGHLINE WINCH TO RAM TENSIONER TO TRANSFER HEAD
① HIGHLINE LEADS FROM WINCH TO RAM TENSIONER LOWER SHEAVES
② HIGHLINE LEADS FROM LOWER SHEAVES TO UPPER SHEAVES & BACK DOWN TO LOWER SHEAVES
③ HIGHLINE IS LED FROM LOWER SHEAVES ON RAM THRU KINGPOST TO TRANSFER HEAD
HIGHLINE WINCH
1
2
3
RECEIVING SHIP
HIGHLINE (SLACK)
RECEIVING SHIP
RAM TENSIONER (FULLY EXTENDED)
RAM TENSIONER FULLY EXTENDED DURING RIGGING OF HIGHLINE TO RECEIVING SHIP
HIGHLINE (TENSIONED)
RAM TENSIONER HAULED DOWN TO MIDSTROKE OPERATING POSITION
RAM (HAULED DOWN TO MIDSTROKE POSITION BY WINCH
DELIVERY SHIP

80.343

Figure 7-15.—High-line winch, ram tensioner, and transfer head.

The STREAM transfer station is made up of the following major components:

1. King post (called M-frame in some ships), which has a track for the sliding block.
2. Sliding block, which is driven up and down on the track inside the king post and carries the transfer head.
3. STREAM transfer head, which carries the load up and down on the king post.

The transfer head carries the sheaves system for the highline and the inhaul wire. The outhaul block is usually mounted on the M-frame (figure 7-16).

The STREAM system requires at each station three winches of two different types. Highline winches operate in a single control mode called speed control. When the control handle is moved to the payout position, the winch pays out the highline. When it is moved to the haul-in position, the winch hauls in the highline. When the handle is centered, the winch brake sets and all movement of the highline stops, regardless of how much pull may be on the wire. The highline winch, in conjunction with the ram tensioner, maintains a tension on the highline.

Each STREAM station is equipped with two electrohydraulic hauling winches: the inhaul winch and the outhaul winch. These winches can be operated in two control modes: speed control and tension control. In the speed control mode the winch holds, pays out, or hauls in, in direct response to the position of the winch control handle. Speed control is used during rigging of STREAM rigs or during rigging and operation of untensioned rigs. Switching the winch to the tension control mode activates a tension-sensing mechanism in the winch, which causes the winch to heave in until the proper tension is reached on the whip, about 1,000 pounds; switching the other winch to the tension control mode does the same thing. So each winch is pulling the trolley in an opposite direction with about 1,000 pounds of pull. As long as the pull is equal, the trolley will remain stationary. If one of the winch control handles is moved toward the maximum tension position, it causes the winch to increase tension and the winch hauls in. At the same time, the other winch senses the increased tension, so to return the ship to its proper tension, it starts paying out. This moves the trolley in the direction of the winch applying the most tension. STREAM with all tensioned whips provides positive control of the trolley and at the same time compensates for the ship's rolling motion to prevent tight lining or overstressing the ships. Since the inhaul and outhaul winches will immediately haul in to put 1,000 pounds of tension on wire ropes when the winches are put in tension control, the inhaul and outhaul bitter ends must always be properly secured and personnel must be clear of the lines before switching winches to tension control.

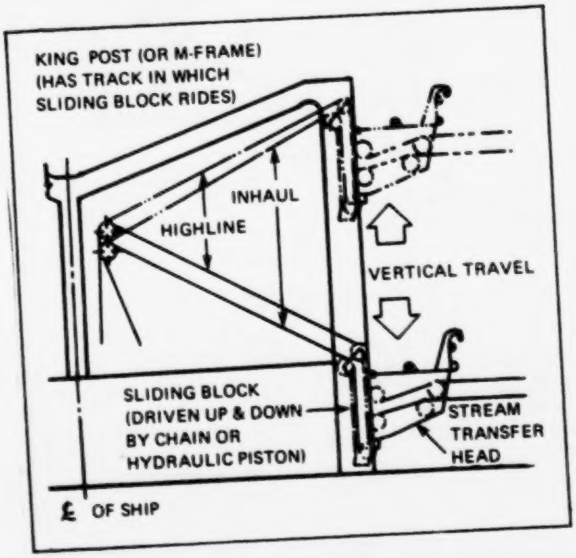


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Figure 7-16.—STREAM transfer head and track.

Receiving ships are equipped with one or more of four basic receiving stations:

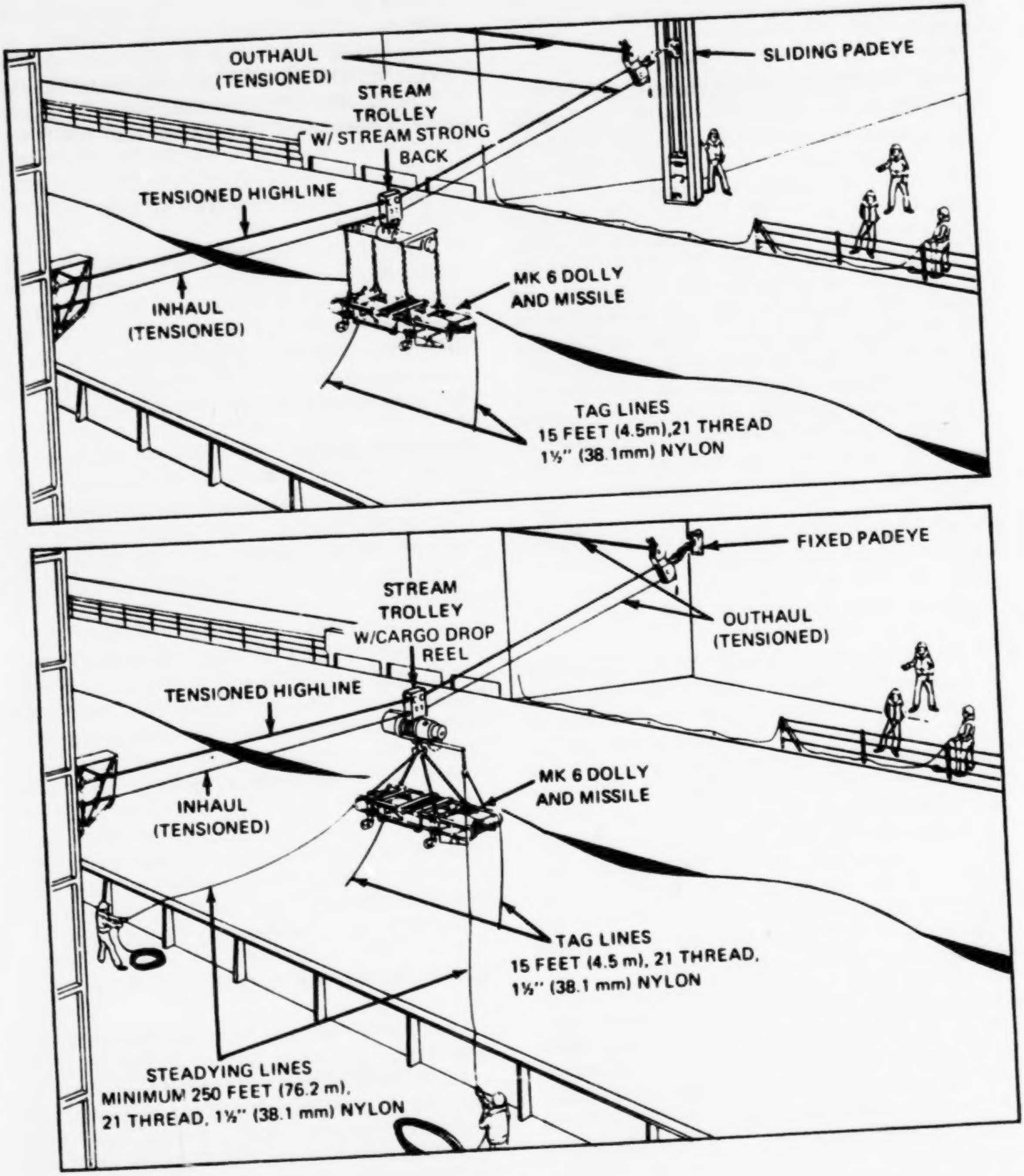
1. Sliding pad eye
2. Fixed pad eye
3. Pendant
4. STREAM-support leg

The hardware for rigging the receiving ship's stations is listed in chapter 4 of NWP 14.

Missile Transferring

Missiles and their components require special handling equipment for intership transfer. This is caused by the large weights or sizes of their loads and their becoming easily damaged during transfers.

- The Mk 6 missile transfer dolly (figure 7-17) is used to transfer noncontainerized missiles and their boosters. It is constructed of tubular


OUTHAUL (TENSIONED)
SLIDING PADEYE
STREAM TROLLEY W/ STREAM STRONG BACK
TENSIONED HIGHLINE
INHAUL (TENSIONED)
MK 6 DOLLY AND MISSILE
TAG LINES 15 FEET (4.5m),21 THREAD 1½" (38.1mm) NYLON
FIXED PADEYE
STREAM TROLLEY W/CARGO DROP REEL
OUTHAUL (TENSIONED)
TENSIONED HIGHLINE
INHAUL (TENSIONED)
MK 6 DOLLY AND MISSILE
TAG LINES 15 FEET (4.5 m), 21 THREAD, 1½" (38.1 mm) NYLON
STEADYING LINES MINIMUM 250 FEET (76.2 m), 21 THREAD, 1½" (38.1 mm) NYLON

63.100

Figure 7-17.—Missile transfer in Mk 6 dolly to sliding padeye (upper) or to fixed padeye (lower).

steel, has a deadman brake system, castered wheels, shock absorbers on each wheel, and fold-down side bumpers. The dolly provides mobility and shock protection for the missile or booster load.

- The STREAM strongback (figure 7-17) is installed in the stream trolley whenever missiles and components are delivered to a sliding pad eye, regardless of what container is used. Missiles and boosters are normally transferred either in their containers or in the Mk 6 dolly. The receiving ship's strikedown system dictates the choice of container or dolly. NAVSEA OP 3192 contains procedures for preparing bare missiles and boosters for transferring and for loading them in the Mk 6 dolly. Missile components are normally transferred on pallets. Ammunition ships carry Mk 45 handlift trucks for use by receiving ships in handling containers. The Mk 45 handlift truck is attached to each end of a container to move the load from the landing area to the strikedown equipment for decanning.

For more information concerning missile transfers, refer to NWP 14.

SAFETY PRECAUTIONS

During the preparation for an underway replenishment (UNREP), plans should be made for the issuance of safety instructions. All hands participating in the evolution should be thoroughly instructed in the hazards surrounding an UNREP and the safety precautions necessary for a successful operation.

Time is an important factor in any evolution; however, speed must never be the ultimate goal. Safety is the primary consideration in all replenishment evolutions, and should be uppermost in the minds and actions of everyone participating in the evolution.

For safe and expeditious handling of explosives during an UNREP, as well as at other times, all personnel engaged in the transfer must know and observe ammunition safety precautions as well as the current evolution safety precautions. Personnel must be thoroughly familiar with the methods and equipment used and their own limitations.

Only essential personnel are allowed at a transfer station during replenishment. Topside personnel who are engaged in handling stores or lines or who are in the transfer area must wear orange-colored, inherently buoyant, vest-type lifejackets that are properly secured. Personnel in the immediate area of the transfer station/landing area must wear construction-type (safety) helmets. These helmets must be equipped with quick-acting breakaway devices, and the chin straps must be fastened and worn under the chin.

Additional safety precautions can be found in type commanders' instructions and NWP 14.

COUNTERMEASURES

Of all the ASW countermeasures, the noisemakers are the most widely used on surface ships. Towed noisemakers are important countermeasures that are designed to protect a ship from attack by acoustic torpedoes. When streamed astern at the proper depth and distance, the noisemakers are effective diversions.

NOISEMAKERS

The noisemakers now in use are the T Mk 6 (called Fanfare) and the AN/SLQ-25 (called NIXIE). There are very few T Mk 6s remaining in the fleet, so we will limit our discussion to the NIXIE.

- AN/SLQ-25 (NIXIE) is an electroacoustic decoy that is used for the protection of surface vessels from acoustic torpedoes. The NIXIE system employs an underwater acoustic projector, housed in a streamlined body, towed astern of the vessel by a combination towing and signal transfer cable (much like the older Fanfare). Because of the classification of the NIXIE system, we are limited in our discussion. For more information, refer to NAVSEA 0967-LP-490-3010, AN/SLQ-25, *Installation, Operation, and Maintenance Instructions.*

BATHYTHERMOGRAPH (BT)

For many years the Navy has been seeking a replacement for the mechanical BT that would be cheaper, more accurate and reliable, and safer to use. After extensive evaluation, an expendable bathythermograph (XBT) system has been accepted. Currently the AN/SSQ-56/60/61 BTs are being extensively used in the fleet. The cost of the XBT system is considered reasonably low. The extra fuel consumed in maneuvers required for a mechanical BT lowering often costs more than the expendable components of the XBT. Also, the XBT is more accurate and has a greater depth range than the conventional BT. Moreover, its use removes speed restrictions on the ship. Readings can be obtained at speeds to 30 knots.

The XBT system is composed of a sensor probe, a canister, a launch mechanism, and a temperature-depth recorder. The probe weighs about 1 pound and is spin stabilized. It contains a thermistor, which senses temperature changes, and a reel of special wire. The canister also contains a reel of wire and holds the probe. The launcher is essentially a tube for holding the canister. It can be installed to provide through-the-hull launching of the probe, eliminating the necessity for sonar personnel to be on deck in rough weather. The recorder plots a track on a strip chart of temperature versus depth in real time. The strip chart is synchronized to the probe's rate of descent.

When you place the canister in the launch tube, a watertight electrical connection is formed between the probe and the recorder, causing the recorder to run for 2 seconds. This action sets the automatic starting circuits that are activated when the probe hits the water. The probe is held in position by a pin protruding from the launcher. Pulling the pin permits the probe to fall free of the canister and fall into the water. (The canister remains in the launcher.) As the probe starts its free fall, the wire commences unreeling from the probe and from the canister. This double unreeling action allows the probe to sink straight down and permits the ship to proceed unhindered.

When the probe strikes the water, an electrode triggers the recorder. The thermistor transmits temperature changes to the recorder, where they are plotted on the strip chart by a stylus. At a depth of 1,500 feet, the probe's wire is exhausted and the recorder stops. A complete readout is obtained in 90 seconds from time of launch. Temperature range of the probe is between 28° to 96°F, with an accuracy of 0.4°F. Depth accuracy is 2 percent or 15 feet, whichever is greater.

MINE COUNTERMEASURES (MCMs)

The concept, doctrine, equipment, procedures, and precautions of mine countermeasures (MCMs) are contained in NWP 27.

The two most important general types of MCMs are sweeping and hunting. Minesweeping is done by going over the mined area with mechanical sweeps that physically remove the mines (for example, by cutting mooring cables of moored mines) and with influence sweeps that provide the influence fields necessary to actuate influence mines. In addition to minesweeping ships and craft, helicopters are used to sweep mines. Minehunting involves going over an area with mine detecting equipment that will find the mines, which are then removed by divers or destroyed by explosive charges.

With less emphasis being placed on minesweeping ships, the helicopter has been developed into an effective minesweeping vehicle for coastal operations. Inherent characteristics that make the helicopter attractive as an MCM vehicle are its speed, safety, maneuverability, flexibility, and freedom from sea limitations. The characteristics, however, that limit its effectiveness include payload and weight restrictions, relatively short time on station (fuel capacity), and crew endurance. With the development of specialized minesweeping equipment that can be streamed and recovered from the air and with the advent of larger, more sophisticated helicopters that are capable of lifting loads of large volume and weight and that have good towing capability, the airborne MCM has assumed a major role in countering the sea mine, particularly in shallow waters.

The U.S. Navy has developed a new MCM class ship whose mission will be to hunt, sweep, neutralize, survey, and clear mines.

The MCM class ship is a new construction ship planned to replace the MSO 422/428/509 class ships. The principal consideration for this program is the requirement to maintain force levels to implement U.S. Navy mine countermeasures objectives. This MCM ship is a new design similar to present MSO class ships. The new class will maintain, to the maximum extent possible, the hull, mechanical, and electrical design of the present MSO class. It is modified, as necessary, to support the additions in combat suite incident to its current mission and the state of the development of mine countermeasures equipments. Overall design of the MCM ship reflects the operational performance requirements of the missions specified in the top level requirements (TLR) for this class ship.

The MCM ship will have a glass reinforced plastic (GRP), sheathed-wood hull, with twin-controllable, reversing propellers that are driven by diesel engines through reduction gears, shafts, and clutches. Its physical size will be somewhat larger than the present MSO class. Because of its role as a minesweeper, the MCM ship will be fitted with a degaussing system to maintain a very low magnetic signature.

SWEEPING

Minesweeping will be discussed in three areas: moored mines, magnetic mines, and acoustic mines.

Moored Mines

A cable known as a sweep wire is towed through the water deep enough to strike the mine mooring. The mine mooring thus contacted will slide along the sweep wire until it engages one of the several cutters spaced at intervals along the sweep wire. The cutter severs the mooring, and the mine bobs to the surface where it can be detonated or sunk by gunfire.

The O-type sweep gear uses two multiplane kites. One, rigged with a four-legged bridle, is called the otter and serves the dual purpose of diverting the sweep from the side of the sweeper and holding down the outboard end of the sweep wire. An identical kite when rigged with a three-legged bridle is known as the depressor and serves to hold down the inboard end of the sweep. The outboard end of the sweep is supported by a float connected to the otter with the float pendant. The length of the pendant determines the depth of the outboard end of the sweep. The depth of the inboard end is determined by the scope of the depressor tow wire. The depressor is connected to the sweep wire by the depressor span pendant, which is a length of chain with a snatch block on one end. The snatch block is clapped over and free to run on the sweep wire; the other end is shackled to the depressor bridle. Sweep gear may be streamed to both sides at the same time; left-hand lay sweep wire must be used on the port side and right-hand lay sweep wire on the starboard side. This is necessary because the action of the water flowing with the lay of the wire provides lift and keeps the sweep wire in a flat or horizontal position. This action prevents the wire from sagging and striking the bottom. All other wire used in minesweeping is right-hand lay wire. In addition to left-hand lay wire there is one other special wire used in minesweeping. This is called serrated wire. It is used with the largest type of sweep gear (size 1) found aboard the MSO. It is made of 4 × 8 feet of high-grade plow steel or stainless steel with two wires in each strand twisted to give the wire a rough surface. A mine mooring sliding along this wire will chafe apart. Because this chafing effect is not wholly relied on, cutters are also used.

Minesweeping cutters are classified as mechanical or explosive. A mechanical cutter has no moving parts and cuts the mine mooring with two saw-toothed blades held in the form of a V. These cutters are attached to the sweep wire and must be towed at a minimum speed of 7 knots through the water to function. The mechanical cutter will not cut chain mine moorings but will cut wire mine moorings up to one-half inch diameter.

Explosive cutters use an explosive charge propelling a cutting chisel to sever the mooring. These cutters will operate at all minesweeping speeds and will cut chain mine moorings up to 1 1/8-inches in diameter.

Magnetic Mines

As defense against magnetic mines, the older minesweepers are constructed of wood and stainless steel, aluminum, and other nonmagnetic metals that, along with an elaborate degaussing system, give them a low magnetic signature. A shallow draft also greatly reduces the danger of the minesweeper in action.

To sweep magnetic mines, the modern minesweeper streams a buoyant cable astern of the ship (straight tail) or to the side of the ship (diverted tail) through which a powerful direct current is pulsed at intervals. This sets up a large magnetic field around the cable and influences the mines. The buoyant cable is called a quadded tail and is made up of four cables wound together for 675 feet. Two of the cables terminate here and are called the short leg. The other two are connected to a single cable extending for another 900 feet; this is the long leg. At the outboard ends of the long and short leg a smaller noninsulated cable 250 feet long, called an electrode, is attached. These electrodes are not buoyant, so they must be supported by special floats.

The inboard end of the tail is plugged into a terminal box on the main deck. Current is supplied by diesel minesweeping generators capable of generating several thousand amperes of current.

Twisting the four cables together in the quadded section eliminates the magnetic field around that part, thereby reducing the danger of exploding a mine too close to the stern of the minesweeper. On the other hand, the field around the single 900-foot section is enormous and will detonate mines many yards away from the cable.

When a straight tail is used, there is no connection between the long and the short leg, the circuit being completed by the salt water. When the diverted tail is used, the legs may be unconnected (open loop) or a special cable may be inserted between the ends of the legs (closed loop). Other methods of sweeping require two sweepers with one or both tails streamed between the ships (catenary sweeps). However, in the most common method of sweeping (group sweeps), several sweepers, streaming straight tails, operate together. Ships are staggered, the second following in the path swept by the first, the third in the path swept by the second, and so forth.

A timing device controls the current, automatically pulsing the current at present intervals.

Acoustic Mines

Sweeping acoustic mines is similar to magnetic minesweeping in that the effect of an approaching vessel must be produced artificially. In this case it is done with an electrically operated hammer which, while sweeping, is towed astern by the sweeper. In one type of hammer a direct current motor actuates through an eccentric, a striker that strikes a diaphragm and produces high frequency sound waves. In a second type of hammer, a low frequency, almost inaudible, output is produced by two opposed diaphragms operated through an eccentric device. The choice of hammers depends on the type of mine to be swept; but regardless of the hammer, its motor may be pulsed or modulated to give the effect of an approaching ship. This approaching effect is vital because a sudden, sharp noise, such as an explosion, will not fire these mines. It merely actuates a countermine bypass circuit designed to prevent the mine from being fired by the explosion of an adjacent mine or a depth charge.

The acoustic hammer is supported by a large O-type float and towed about 1,500 feet astern by the sweep wire. The electric cable for the hammer's electric motor is secured to the sweep wire in bights to prevent the electric cable's taking a strain. Formerly both the sweep wire and electric cable were supported by attaching several small O-type floats to the sweep wire at regular intervals. Now, however, there is a buoyant cable that replaced the old cable and eliminated the need for the small floats.

For the hammer to operate at peak efficiency, or at resonant peak, as it is called, it must be at a specific depth. Therefore, a special one-half inch wire pendant of the desired length secures the hammer to the large float.

Thus far, attempts to produce artificially the effect (of a ship passing over) that will detonate pressure mines have been unsuccessful. Therefore, after considerable experimenting, the Navy has decided that one solution is to actually use a ship to fire these mines. Future plans call for converting or building ships for this purpose. This type of ship is designated as minesweeper special (MSS).

Many mines are equipped with timing devices that arm the mines at predetermined times after they are planted. The intervals selected may range from a few minutes to several weeks.

In the latter case, a force abandoning a harbor to the enemy can sow mines in and around the harbor, and the mines will arm themselves after friendly shipping has had time to clear the port. Enemy harbors also can be strewn with mines set to arm themselves at different intervals, presenting a constant minesweeping problem to the enemy.

Sterilizers, on the other hand, deactivate mines after predetermined times of days to years. One reason for their use is to alleviate the mine clearing problem after cessation of hostilities. Another use is in mines to be planted in an enemy harbor soon expected to fall into friendly hands. The mines arm almost immediately and raise havoc with the evacuating enemy shipping. About the time or shortly after the port is expected to fall, the mines sterilize themselves making it unnecessary to sweep the friendly mines before the harbor is safe to use.

Most mines, including the contact mines, contain one or more antisweep devices designed to frustrate minesweeping efforts.

Most influence mines, for example, contain ship counters that allow the mines to be set to permit several ships to pass over the mines before they fire. The pulsing in a magnetic sweep is one method used to counteract the ship counter. Each pulse of the current through the tail gives the effect of the magnetic field of one ship passing over the mine; so, by pulsing the current in predetermined cycles of short duration, one pass of the minesweeper over the mine may influence the counter more than once.

Newer types of mines, however, have a device that will activate a countermine bypass circuit if the first pulse is followed too closely by the second pulse.

The bypass circuit in the acoustic mine also is an antisweep device developed to counter the practice of dropping depth charges or concussion grenades to fire the mines.

There also is an antisweep mine designed to be planted in fields of moored mines. This mine has a tension firing mechanism that is armed by hydrostatic pressure. When a sweep wire makes contact with a mine mooring, it slides up the mooring until it engages the firing ring at the base of the mine. The pressure of the sweep wire on this ring is transmitted to the firing pin through a mechanical linkage, and the mine fires severing the sweep wire. The result, of course, is that the component parts of the sweep must be retrieved or replaced and the sweep streamed again.

Combination mines are forms of antisweep devices because they require the sweeper to stream more than one type of sweep. A tactical reference in this area is NWP 27, *Mine Countermeasures*.

As mentioned earlier, the helicopter has become a major force in minesweeping operations. The methods are similar to the surface craft procedures. Because of the classification of the helicopter procedures, we will not discuss them in any detail in this text.

The primary AMCM aircraft is the Sikorsky-built RH-530. Towing equipment used to sweep mines comes in kit form, and there are basically three kits for sweeping, the moored Mk 103, the acoustic Mk 104, and the magnetic Mk 105 (figure 7-18).

HUNTING

Minehunting can be accomplished by visual, magnetic, or sonar—the most widely used. The AN/SQQ-14 minehunting sonar is now in fleet use.

A very important part in mine countermeasures is played by members of explosive ordnance disposal (EOD) detachments. A minefield may be located by various means; but unless the type of mine is known, sweeping will be a hit-or-miss affair not likely to produce the desired results. Therefore, EOD personnel will go down to look at the mines, and, if necessary, recover one for study. From information gained in this manner, proper sweeping techniques can be devised. Mines in shallow water, in congested harbors, close to piers, or which for some other reason cannot be swept are disposed of by these personnel.

Each branch of the service is responsible for handling explosives on its own bases. However, any explosives found in U.S.-controlled waters are the responsibility of the Navy, and Navy EOD detachments who will be called upon to dispose of them. In addition, civilian police forces frequently request their assistance in handling explosives for them.

EOD units are made up of detachments consisting of one officer and three or more enlisted persons. All are volunteers, and all are graduates

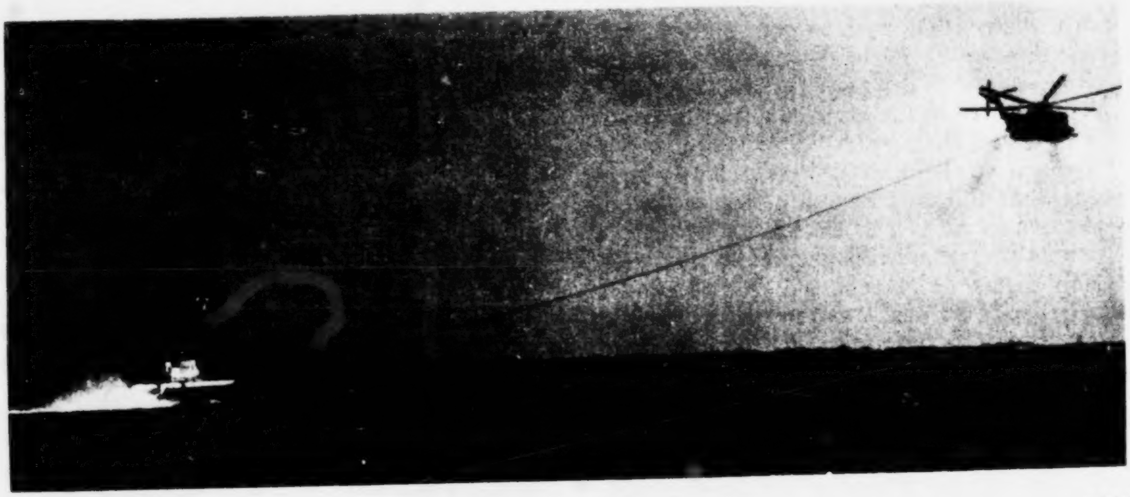


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Figure 7-18.—Mk 105 magnetic sled.

of the Nayv EOD school at Indian Head, Maryland.

REFERENCE LIST

Boatswain's Mate 3 & 2, NAVEDTRA 10121-G, Naval Education and Training Command, Pensacola, Fla., May 1981.

Boatswain's Mate 1 & C, NAVEDTRA 10122-E, Naval Education and Training Command, Pensacola, Fla., January 1981.

Replenishment at Sea, ATP 16 (B), Office of the Chief of Naval Operations, Washington, D.C., June 1981.

Replenishment at Sea, NWP 14 (B), Office of the Chief of Naval Operations, Washington, D.C., June 1982.

Shipboard Helicopter Operating Procedures, NWP 42(F), Office of the Chief of Naval Operations, Washington, D.C., January 1984.

Sonar Technician 3 & 2, NAVEDTRA 053-05-45-82, Naval Education and Training Command, Pensacola, Fla., June 1982.

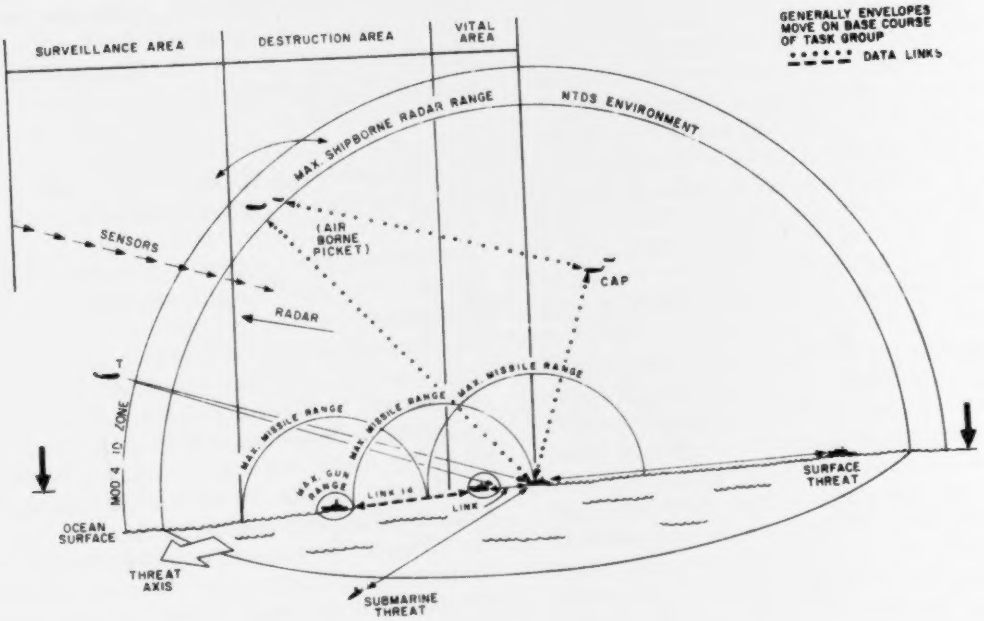
Standard Organization and Regulations of the U.S. Navy, OPNAVINST 3120.32, Office of the Chief of Naval Operations,,Washington, D.C., March 1979.

CHAPTER 8

SHIP'S WEAPONS SYSTEMS

In this chapter we will discuss antiair warfare at length and briefly mention ASW and surface warfare. We have purposely omitted most of the technical data that you will need to know in controlling the different types of installed batteries. This is essentially a *non-technical chapter*. It includes, by way of introductory material, the naval tactical data system (NTDS), a brief discussion in general terms of the possible missions, and some of the capabilities and limitations of missile, gun, and ASW batteries. We do not wish to imply that even a good portion of what you will need to know is found in this chapter. Far from it. There are other elements. You will have to read and reread all the available texts, technical manuals, tactical doctrine publications, and other sources of information. In addition, you will have to drill repeatedly in the various phases of operations. The remaining element—experience—can only come with time on the job.

Before being capable of controlling your ship's systems, you will have to have a complete grasp of the rates of fire, range, accuracy, reaction times, and the minimum station manning levels to bring the various systems on the line, as well as a knowledge of the major inputs to the systems. Perhaps a better way to view the problem of the adequate knowledge required to do your job, would be to evaluate the basic mission of your ship; that is, what it was designed to do, in light of an operational order (OPORD) in a task group. What would you, as weapons liaison officer in a combat information center, have to understand? Figure 8-1 shows a simplified


SURVEILLANCE AREA
DESTRUCTION AREA
VITAL AREA
GENERALLY ENVELOPES MOVE ON BASE COURSE OF TASK GROUP
DATA LINKS
MAX. SHIPBORNE RADAR RANGE
NTDS ENVIRONMENT
(AIR BORNE PICKET)
SENSORS
CAP
RADAR
T
MAX. MISSILE RANGE
MAX. MISSILE RANGE
MAX. MISSILE RANGE
MOD 4 ID ZONE
MAX. GUN RANGE
LINK 14
LINK
SURFACE THREAT
OCEAN SURFACE
THREAT AXIS
SUBMARINE THREAT

63.56

Figure 8-1.—Schematic representation of threat/surveillance area at a tactical environment for a task group at sea.

diagram of a task group with two picket ships. The various envelopes depicted are essentially the maximum effective ranges of various radars and sensors and missile/gun systems. Try to keep this picture in mind as you read this chapter.

ANTIAIR WARFARE

In an antiair warfare environment during World War II, when an air attack came and there was enough time, the task group would close up, thus massing gunfire power. This resulted in an outer zone for the combat air patrol (CAP) defense and an inner zone of gun defense. Today, basically the opposite result is attempted under an air threat situation; that is, the task group is opened out, resulting in a fleet antiair warfare defense in depth. There are three zones used: an outer CAP zone, an overlapping long and short missile kill zone, and the inner gun zone. With the NTDS, these zones are comprehensively correlated as far as target detection and surveillance are concerned. This information is available to all ships of the group either through a direct NTDS computer-to-computer link or through a teletype link to non-NTDS ships.

This, admittedly, is an oversimplification, and in actual practice probably will vary greatly. The idea, however, is the important doctrine; that is, defense in depth against an assumed nuclear warfare threat. Defense of the group is paramount; but, in the last analysis, defense of your ship's zone of responsibility is your job. This is why you must have a complete understanding of what your ship is capable of doing. For more detailed information on antiair warfare, see NWP 32. For more information on basic antiair warfare concepts, see chapter 2 of NWP 32.

KNOW YOUR TRAINING LEVEL

As important as it is to know your systems thoroughly, it is equally important that you know what your people are capable of doing. Since we covered training in chapter 3, we will only comment on the one aspect of training here as it relates to controlling your systems. No matter how well you have trained your people in the operation of their equipments and systems, all will be to no avail if they do not understand their responsibilities and authority under the ship's battle doctrine. If they don't use this information correctly, there is a high probability of a communication breakdown because they will not do what you want them to do. This is why standard commands should be used at all times. It is a well-known fact that the individual listener will mentally presort what is heard and discard, so to speak, that which is thought not to apply. This is one of the primary reasons for insisting that the standard command usage be stressed continuously.

TERMINOLOGY

The weapons officer procedures at your battle station, aboard most types of ships, will be closely related to CIC procedures. Your performance of these duties or procedures will improve vastly if you understand the terminology and procedures used in the CIC area. The commanding officer's decisions are based on the evaluated information from CIC, and the effects of these decisions are channeled through you to your teams and their associated weapons systems.

Generally speaking, the battle stations on guided missile ships operate, with regard to equipments and information flow, in the same manner as those in frigates or cruisers equipped with missiles. As a matter of observation, the only major difference among ships equipped with missiles, guns, and underwater weapons systems, besides the marks and mods of equipments, are the physical arrangements, performance parameters, and location of the various equipments and operating personnel.

THE ANTIAIR WARFARE COMMANDER (AAWC)

The composite warfare commander assigns the AAWC. The AAWC and his staff are usually embarked on a missile cruiser.

The entire AAW picture is presented to the commander on various display plots. The commander maintains communication, except during some conditions of electronic silence, with all of the AAW units. The commander receives all "bogey" (unfriendly air contact) information from the detecting ship or aircraft.

All units on the AAW net receive an initial contact report as it comes over in color-coded Cartesian coordinates, or on an NTDS track. They are required to maintain in their CICs an X-Y plot that locates the contact relative to their own ships. All AAW units maintain an X-Y track on the reported contact. The detecting and reporting unit makes a preliminary calculation to the bogey's course, speed, and altitude. Geographical reference (GEOREF) coordinates may be used in lieu of the color-coded Cartesian coordinates if you are operating with foreign forces or with one of the other services.

If the target is outside the weapon release point, the AAWC has time to ponder defensive action. This time is spent in evaluating the target. Does its course and speed indicate that it will be a definite threat to the task group? Has it maintained course, speed, and altitude? Has it been confirmed as an enemy? Will it make a high-level bombing run, torpedo attack, and so forth? Or is it perhaps a diversion to draw attention from a larger attacking force?

If the bogey does pose a definite threat, the AAWC must decide which weapon in the defense arsenal will be used. Our first line of defense is the CAP. The CAP consists of a carrier-based interceptor aircraft that patrols assigned sectors above the task group. In addition to operating at great ranges from the task group center, CAP has an advantage over other destructive means. If an intercepting aircraft misses on the first pass, it is capable of reattack provided its speed exceeds that of the attacker. If CAP indicates that an intercept is possible, the AAWC may order CAP to be vectored to the target. Vectoring is accomplished by an air controller in the AAW unit that has been given CAP control. The intercepting aircraft may be able to visually identify the target, thereby confirming its belligerent status.

We can miss with CAP just as we can miss with guns or missiles. The CAP may be out of position, the relative speeds may be so great that the attacker might slip by, and conditions of poor visibility or poor radar reception during the terminal phase of the intercept might render CAP useless. Now comes our second line of defense—the surface-to-air missile. If a target does penetrate the missile defense perimeter, CAP may be "salvoed" (disengaged). In that case, the target would be designated a "bird target"; that is, the target is to be engaged by missiles. Actually, bird target indicates the particular type of surface-to-air missile to be used.

Many things were happening on the missile ship while we were attempting the CAP intercept. Extremely accurate fire control radars were being designated (directed) to the target by an elaborate weapon direction system. The designation system sent continuous target information in three coordinates (range, bearing, and elevation) to the fire control directors. The directors then "locked on" (acquired and shifted to automatic radar track) and became electronically independent. A computer solution started generating simultaneously with director acquisition and track. Among other things, the computer solved the required launcher orders that positioned the missile launcher in bearing and elevation.

Computing devices also provided accurate solutions to the target's course, speed, and altitude. These values were observed in the weapons control station (WCS), sent by sound-powered telephone to CIC, and then over the AAW net. The solution was continuous, and subsequent changes in target movement were immediately noted. The equipment in the WCS further indicated whether the target would penetrate the ship's missile envelope (maximum missile range perimeter).

If it appears that the target would penetrate, the ship reports acquisition and track (see standard operating procedure for your unit) to the AAWC. This report indicates that the ship is ready in all respects to engage the target with missiles. Upon receipt of more than one such report, the AAWC will decide which ship is to take the target under fire. The commander considers which ship is in the best position for a kill and the type and number of missiles remaining on board. When this decision is made, the bogey is sent over the AAW net as a missile target to the selected ship. If for some reason the target is not destroyed after multiple missile salvos have been fired, reliance must be placed upon our last line of defense—conventional gunfire.

Do not sell conventional gunfire short! It is still part of our armament and very much in evidence in certain phases of the AAW picture. For example, concentrated gunfire can disrupt an otherwise orderly attack. New gun fire control systems can adequately handle current and projected threats. The guns are not invalidated by the target's speed, but they are seriously limited when the target's RELATIVE MOVEMENT in bearing, elevation, or range exceeds the designed limits of the gun fire control system.

Now that we understand the general sequence of events, let's take a look at some of the battle stations and see what happens in each during a hypothetical air attack. Space is too limited to take you through the same stations for a separate surface or ASW attack. After this, we will look at some of the general capabilities and general limitations of gun, missile, and ASW weapons systems.

COMBAT INFORMATION CENTER (CIC)

The beehive of activity we find in our modern CIC confuses the casual observer. Little sense of direction in the individual efforts of the personnel is found. Nevertheless, the drama that follows an initial contact report and the varied array of equipment used are impressive. There seems to be a person assigned in every square foot of space. These personnel are engaged in talking on telephones, looking at radarscopes, or drawing rectangles and circles (or semicircles) on transparent plotting boards.

The primary mission of the CIC is to provide an organized collecting, processing, displaying, evaluating, and rapid disseminating source of pertinent tactical information and intelligence to the appropriate command and control stations.

DETECTING

The first and probably the most critical part of the AAW problem is the initial detection of the target. It is possible to detect a target by using passive equipment, such as electronic support measure (ESM) gear. This supersensitive equipment detects electromagnetic radiation, indicates its direction, and measures the transmitter's frequency, pulse width, and pulse repetition rate. Even the antenna's rotation rate can be determined with this gear.

The ESM operator refers to a publication that describes the operating characteristics of known radiating equipment. Then what type of equipment has been detected is ascertained and, more important, what type of vehicle the equipment is probably mounted on. In other words, an educated guess is made as to whether the contact is a particular type of enemy aircraft, submarine, or perhaps just a member of one's own operating force. ESM gear has serious drawbacks in that it cannot measure the range or altitude of the contact, even though the range might possibly be determined by ESM triangulation.

Air search radar is the primary means by which we detect targets. The air search radar fixes the target's position in two coordinates—range and bearing. Some CIC air search radars, particularly those associated directly with fire control equipment, have a height or altitude finding capability. The three coordinate radars have a distinct advantage when designating a fire control director to the target. The height quantity is converted into an angle of elevation and eliminates time spent in large sector searching in elevation by the director.

LOW FLYER PROBLEM

The most pronounced single limiting factor in air searching is the radar's inability to follow the curvature of the earth and detect low altitude targets beyond the horizon. Some radio frequencies will follow the curvature of the earth for great distances provided the waves are propelled by sufficient power. This is accomplished by bouncing the radio wave between the earth's surface and the ionosphere. Since the ionosphere curves around the earth, the reflected radio waves will also curve.

Shortwaves are in the high-frequency range of the spectrum. Radar waves are considerably higher in frequency. The higher radar frequencies will penetrate the ionosphere with little or no reflection occurring. They penetrate primarily because of their shorter wavelength. We will not get involved in a discussion concerning the "whys" of this penetration. We are more interested in the end result, which is a desirable straight line-of-sight transmission.

Electromagnetic wave diffraction is not considered in our discussion of low-altitude aircraft detection. Diffraction is stated simply as the tendency of radio energy to follow a curved surface. Frequency is not necessarily a limiting factor in diffracting a wave, and this means that the diffraction principle could be applied to radar and the horizon. A target beyond the horizon might very well be "illuminated." However, the small range advantage in applying this principle does not eliminate the problem of detecting low-flying aircraft.

Range determination by radar is based on an old mathematical standard—the distance, rate, and time equation. Distance (range) is the unknown, rate is the constant (186,000 miles per second), and time is the variable. Radar measures the time it takes for transmitted energy to travel to and from the target, divides it in half, multiplies the quotient by the rate, and the resulting product is the distance to the contact.

You may have decided at this point that a low-frequency radar, making use of the ionosphere reflection phenomenon, could provide adequate coverage of the blind area beyond the horizon. Perhaps it could. However, the technical problems encountered in this attempt are staggering. We would have to know the height at which reflection of the wave occurs, and the primary factor in this determination is the ionospheric density. Density of ionization at different altitudes makes the ionosphere appear to have layers. Actually there is no sharp dividing line between the layers of ionization. Suppose we could predict how much density is required to reflect the wave. Could we then predict with accuracy at what height reflection would occur? Even with an educated guess, we would be further victimized by the sporadic ionizations that occur at varying density in each layer.

The ionosphere is a medium that causes both refraction and reflection of the wave. The wave, in refracting, is subject to power losses that depend primarily on the wave's angle of incidence with the ionosphere. The ionosphere also causes minute changes in the speed of the propagated wave, and thus further complicates the distance, rate, and time equation.

One last comment and then we will leave this unconquered area to the scientists and their devices. If we were to suspend ourselves in the ionosphere and look down to the earth's surface with magnified vision, we might be able to see an aircraft standing out in bas-relief against the water. Electronically, this is not the case. It is difficult to detect a target, say, 50 feet above such a massive reflecting surface.

If we did not have a line-of-sight transmission in radar, the time factor would be in error. Errors in time mean errors in range. Errors in elevation and bearing would also be noted. To sum it up, current knowledge and the need for accuracy force us to use higher frequencies, thereby making the blind area of the ship's radar something we will just have to accept.

A straight line extending from the air and surface search antennas and tangent to the horizon represents the maximum detectable range of zero altitude targets. This range is proportionally increased by an increase in the target's height. Detection range could also be extended by raising the height of our antennas. Unfortunately, we cannot depend on the targets accommodating us by flying at high altitudes, nor can we raise the heights of the transmitting antennas beyond the restrictions imposed by the ship's designers. We must take another tack.

Instead of considering the AAW unit and its "low flyer" detecting limitations, let us look at the unit as an integral part of a whole. The whole, in this case, is a task group. Tactically speaking, it is our mission to protect the vital area of the task group and not the units comprising it. Protecting the vital area is easier than protecting a single ship when we discuss the problem in terms of target detection.

The task group is deployed so that some of the units are operating many miles from the task group center. These outer perimeter units extend greatly the task group's radar surveillance. They can be used to destroy a target with their ship's armament or to vector CAP. Still other units with the same capability are strategically placed between the outer perimeter and the task group center.

Airborne early warning (AEW) aircraft are stationed above the task group as insurance against the penetration of the surface units' radar network. These aircraft represent a great increase in radar antenna height; consequently, their radar range capability is limited only by altitude and the design characteristics of the radar. The AEW aircraft is a flying radar station, and it can also be used to vector CAP.

DIFFICULTIES IN DETECTING

Atmospheric conditions will sometimes affect target detection. A moisture-laden cloud might appear to be an air contact on the scope. This false target would soon be discounted by the radar operator since it will have a very low speed. Rain squalls, storms, and so forth, may temporarily obscure actual air contacts. But if we are hampered by weather, so are the attackers. Extremely adverse weather conditions lend some doubt as to the feasibility of an air attack. Nevertheless, we must be prepared.

Target detection is made more difficult when the enemy is "jamming" our radar. One form of jamming is more or less semiactive and consists of dropping "rope" or "chaff" from an aircraft. This jamming material is made of aluminum foil strips that are cut to resonate at a particular frequency. The effect is similar to what we would see if numerous little transmitters were reradiating our air search energy back to us. This type of jamming is easily recognized on the scope because of the almost linear pattern it presents. Its success lies in the aircraft's ability to saturate our scope with false targets, thereby obscuring the real ones.

Some electronic countermeasure (ECM) equipments can be used for active jamming. We are more concerned with enemy aircraft acting in this capacity than surface units, because ships must be extremely close in range to be effective for active jamming. ECM equipment can automatically find our transmitting frequency and pulse repetition rate, and then transmit "down your throat." On some radarscopes, this type of interference shows up as "railings" or "fence posts." On other scopes, it may look like sine waves or "snow."

What can we do about jamming? To be effective, the chaff aircraft must penetrate our entire air defense network. It is doubtful that this can be done since the chaff pinpoints the aircraft's position to practically every fire control director in the task group. Also, the aircraft would be recognized immediately as an enemy, thus eliminating the normal evaluation time. If the aircraft chose to drop chaff outside our defenses, it would be announcing an attack. Moreover, fire control radars have been known to look right through this chaff.

Many antijam circuits have been incorporated in our modern radars to combat active jamming. Frequency control power devices change our transmitting frequencies at the touch of a switch on some radars. Electronic differentiating circuits change the fence posts into narrow spikes before they are displayed on the scope. Manually operated pulse repetition controls vary the repetition rate of our radars. Some radars have an automatic pulse repetition variance that operates at a random rate, making it virtually impossible for countermeasure gear to lock on. The fence posts would then wander across the scope but the target's movement would be consistent in direction and, therefore, easily discernible from the wandering fence posts.

DISPLAYING

There are numerous display boards in CIC. Many of these boards display data concerning friendly units. Voice call, IFF codes, single-letter designators, and so forth, provide a ready reference for watch personnel. Among other things, the plotters of friendly contacts will have to plot formation changes, positions of friendly aircraft, and make changes to the IFF codes with each succeeding aircraft launch.

In our discussion of displays, we will not cover the GEOREF system, although it continues to be used. The color-coded Cartesian coordinate system of reporting contacts was developed for use with NTDS. In most cases, GEOREF is used solely for backup of the X-Y system.

The Cartesian coordinate (X-Y) grid system was originally adopted by the Navy for use with the NTDS. The computers used in NTDS compute every position, in X-Y coordinates, in relation to a known reference point.

Positions transmitted from NTDS ships to conventional ships (on circuits such as Link 14) have always been given in X-Y grid coordinates. This requires conventional ships to convert the X-Y grid positions to coordinates in whatever grid system they are using.

To eliminate confusion and decrease the plotting delays created by using different systems, the Navy has adopted the Cartesian coordinate grid as the standard grid for contact reporting, particularly in AAW. Every ship now uses the Cartesian coordinate grid system.

The officer in tactical command (OTC) establishes the center of the grid, which is called the data link reference point (DLRP). It may be given either as a latitude and longitude or as a geographic landmark.

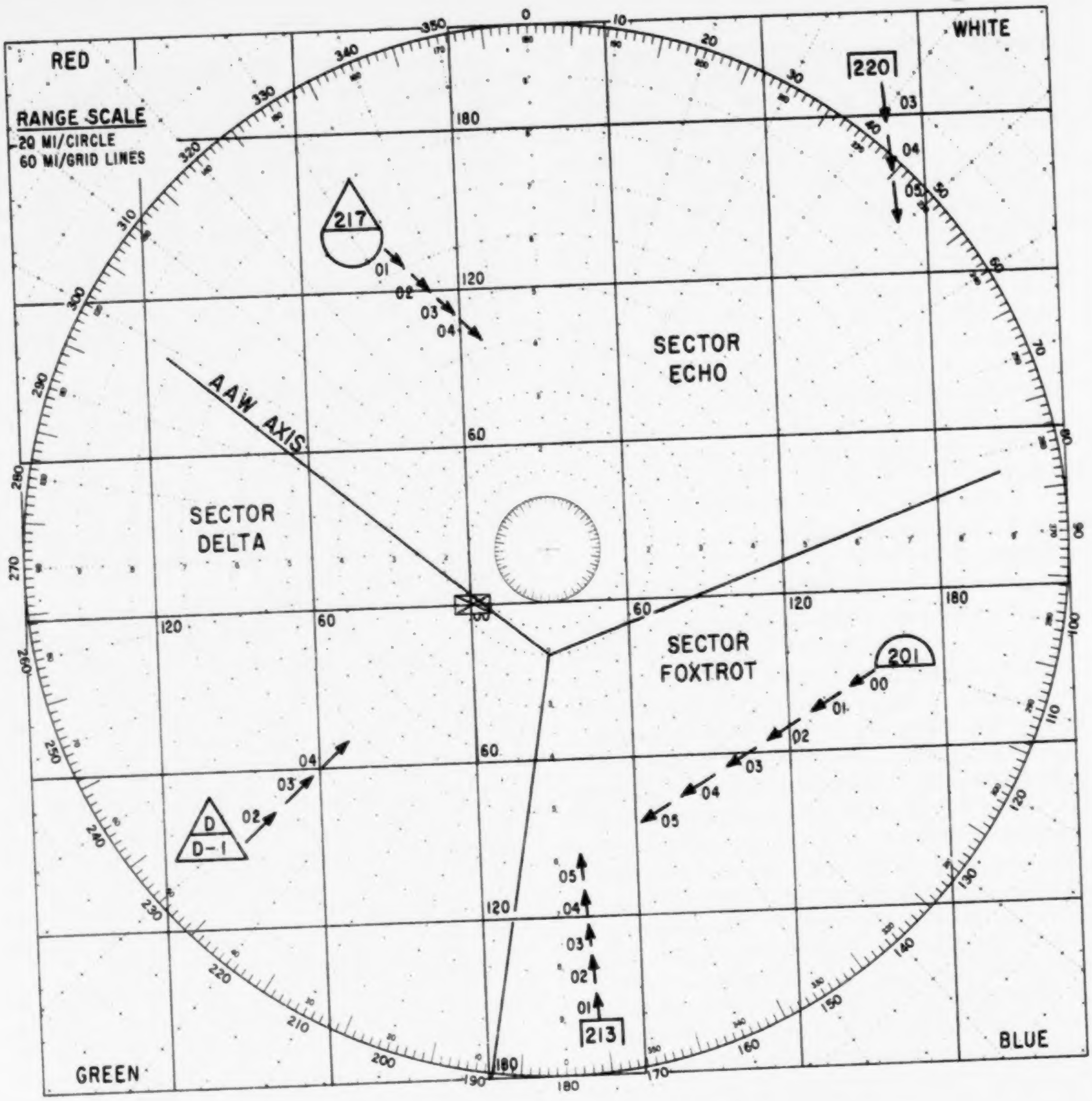
The Cartesian coordinate grid contains four quadrants, each designated by a color, as shown in figure 8-2.

RED is the northwest quadrant; WHITE is the northeast quadrant; BLUE is the southeast quadrant; and GREEN is the southwest quadrant.

Grid positions are indicated by a color followed by six numbers, such as Red 060 100. The first three numbers are the X component and indicate the number of miles east or west (left or right) from the DLRP. The color, of course, identifies the quadrant in which the numbers are located. In this case, since the color is red, the X component is 60 miles to the left (west) of the DLRP. The last three numbers are the Y component and indicate the number of miles up or down (north or south) from the reference. In this case, the Y component is 100 miles up (north) of the DLRP. In figure 8-2, the position of track number 201 at time 05 is Blue 060 075; bogey D-1 at time 04 is Green 050 050; track number 220 at time 05 is White 170 140; and track number 217 at time 04 is Red 005 110.

Figure 8-2 shows the Cartesian grid superimposed on a vertical plotting board. The grid reference point is located 35 miles to the southwest of own ship. The plotters behind the board plot targets in polar coordinates (bearing and range) from own ship. The plotters in front of the board plot in Cartesian coordinates, since they are receiving Cartesian coordinate positions of targets from the other ships. Anyone observing the plot can readily see a target's position in polar or Cartesian coordinates.

If all of the ships in the fleet or squadron were NTDS ships, they would be tied together by Link 11 and the exchange of information would be automatic.


RED
WHITE
RANGE SCALE
20 MI/CIRCLE
60 MI/GRID LINES
217
01
02
03
04
220
03
04
05
SECTOR ECHO
AAW AXIS
SECTOR DELTA
SECTOR FOXTROT
201
00
01
02
03
04
05
D
D-1
02
03
04
05
04
03
02
01
213
GREEN
BLUE
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
310
320
330
340
350
60
120
180

74.282

Figure 8-2.—Long range vertical plotting board with Cartesian coordinate (X-Y) superimposed.

EVALUATION

The process of evaluating is continuous from the moment of detection to the subsequent intercept of the target. The tools we use most often in evaluating are the target's relative position, its course, speed, and altitude, and its automatic response to an IFF challenge.

As we have seen, a contact may first appear on our display as the result of an X-Y report from another AAW unit. Included in this report will be a calculation of the contact's course, speed, and altitude. This information is sometimes hastily computed because of the need for immediate dissemination to the other units in the task group. Quite often, initial minor inaccuracies will be noted when compared to the subsequent reports from that same reporting unit.

The mere mention of a contact on the reporting net indicates that the reporting unit is unable to receive the correct IFF response. It is quite possible that the IFF equipment may be functioning improperly. The only reasonable recourse in the event of no IFF return is to get as many AAW units as possible on the contact. Perhaps they can receive the correct IFF response or locate the contact on their ESM gear. If the IFF equipment fails to identify, maybe the contact can be recognized by evaluating the ECM radar's characteristics. You might also identify the bogey by accounting for all of the known friendlies in the area. This process of elimination and the evaluation of ESM information consume time, and time is not always available. If time is short and we cannot receive the correct IFF response, we must assume that the contact is an enemy.

IDENTIFICATION, FRIEND OR FOE (IFF)

IFF equipment is the main source for contact identification information. It is associated directly with search radars and transmits an IFF challenging pulse immediately following the radar pulse. Basically, the IFF system is composed of an interrogator subsystem and a transponder subsystem. The interrogator transmits challenges on a frequency of 1,030 MHz, receives replies, and processes them for presentation. Immediately upon receipt of a challenge from an interrogator, the transponder transmits a reply on a frequency of 1,090 MHz. Interrogations are pulse-coded transmissions, the characteristics of which are determined by the interrogation mode. Transponder replies contain coded identification and altitude information. An IFF interrogator subsystem is normally associated with a radar and is called a "slaved" system. The IFF interrogations are synchronized with the radar transmissions and the interrogator pulse repetition frequency (PRF) is usually equal to either the radar PRF or a submultiple of the radar PRF. The interrogations are transmitted just before radar zero-range time, allowing transponder replies to fall near the associated radar targets on an indicator. Interrogations by IFF are transmitted on a rotating directional antenna (usually mounted atop a search radar antenna), and transponder replies are received on this same antenna. Transponders receive interrogations and transmit replies on an omnidirectional antenna.

A ship may contain one or more interrogators, but only one transponder. In general, the interrogators and the transponders work independently of each other. The only interconnection between the two is a suppression signal used to inhibit the transponder from replying to the ship's own interrogators. The IFF system in use is the AIMS Mk XII. It has two primary functions. First, it provides a means of improved air traffic control (ATC) of both civil and military aircraft, identification, and code monitoring for friendly aircraft and surface vessels. Second, it provides a crypto-secure method of identifying military craft.

CIC is directly responsible for IFF equipment and its operation. Without intelligence from CIC, the weapons control station might shoot down everything in the vicinity of the task group. We have discussed but a few of the CIC's functions, and it would seem that we are putting all of our eggs in one basket in relying so heavily on that station.

IFF is so important in AAW that some backup must be provided. This is done by installing IFF challenge control boxes for use by weapons personnel in the CIC and the weapons control station. This IFF capability is not associated with fire control radar. It is still part of the air search radar. You will see later how the air search radar can be monitored at the weapons control station. The weapons control station can then function independently of the CIC with some loss in overall efficiency. It should be emphasized that this is an emergency measure and will not be used when all stations and equipment are operating properly.

The task group may want to conceal its whereabouts in a before-force-discovery situation. This necessitates the setting of an EMCON (emission control) condition, which reduces or eliminates radar and radio transmissions in varying degrees depending on the tactical situation. In target detection and identification, ESM gear assumes a much greater importance if the EMCON condition prohibits the use of radar and IFF equipment.

EVALUATOR/TACTICAL ACTION OFFICER (TAO)

The "boss" for AAW in CIC is the evaluator/TAO. We could fill volumes in a discussion of the duties and responsibilities of the evaluator/TAO. In this text, we will have to be content with the briefest description.

The evaluator/TAO is responsible for identifying the contact, and for determining the type of attack most likely to be made. Also, the evaluator/TAO is responsible for an estimation of the target's weapon release range. Generally speaking, the determination of the target's weapon release range is not of paramount importance when interception is with aircraft since the practice is to get out there with CAP as soon as possible. It would be a definite factor, however, in the case of a saturated raid when the evaluator/TAO must select the most critical target. The most critical target, excluding the type of weapon it carries, is usually the target with the nearest or earliest CPA (closest point of approach), or a target involved in jamming.

The target's radar characteristics, along with speed and altitude, may reveal the aircraft type and, therefore, the weapon's capability. Armed with this information, the evaluator/TAO, who is well versed in aircraft tactics, can determine which is the most critical target in regard to weapon type and release point.

Along with the selection of the most critical target comes the necessity to know the ship's defensive capability. The evaluator/TAO must be knowledgeable in this area to recommend the type of armament to be used in the kill and to be reasonably sure that the selected weapon is capable of a kill. What are the weapon limitations? Will the target enter the missile blind zone (firing cutout area caused by the ship's structure)? If so, will the ship have sufficient time to change course and unmask its missile battery? Or, would it be better to fire a nuclear missile in the face of a concentrated raid? Are these nuclear missiles available? For that matter, what is the actual count of all missiles remaining on board?

Further, are all of the missile directors engaged? Can AA gunfire cope with a particular target? Once again, how high is the target, what is its relative movement, is it in the blind zone, or will it reach its weapon release point beyond the range of the AA gunfire? In the latter case, perhaps a shifting of targets at one of the missile directors is indicated. These are only some of the many questions confronting the CIC evaluator/TAO.

All intelligence information is collected and made available to the evaluator/TAO. A knowledge of enemy aircraft capabilities and limitations, both in equipment and tactical application, is essential. The evaluator/TAO must be able to estimate the target's priorities and probable intentions. The evaluator/TAO must be aware of the geographical location of friendly forces, particularly in relation to the enemy's air facilities. In addition, the evaluator/TAO must keep abreast of any weather or atmospheric developments and their effect on flight operations and radar performance.

Evaluation is a process that involves a continuing appraisal, or estimate, of the existing air threat. It terminates with the "splashing of the target." With very little time available to detect and successfully counter a raid, responsibilities must be decentralized as much as possible. There may be no time for the commanding officer to request permission of the AAWC to launch short-range missiles, and there may be no time for the evaluator/TAO to ask the commanding officer for permission to take the raid with CAP. And sometimes, when confronted with a surprise attack, there is no time for the weapons officer to wait for information from CIC. As a matter of fact, the director officer may commence firing when the situation warrants it.

DISSEMINATING

Up to now, we have been collecting information in our CIC clearing house. It is time we put that information to a more active use. The next item we will discuss is the sending, or disseminating, of information to all battle stations on the ship that have a need to know. The principal recipients are the weapons control station (WCS) and the commanding officer's tactical plot (COTP). Flag plot is another station that may receive the same target information, depending on whether a flag officer is embarked.

Instantaneous and accurate data are sent from CIC to these battle stations through a closed-circuit television network. A television camera, mounted in CIC, is focused on the phase two plot. Television receivers are located in weapons control, COTP, flag plot, and the air control section of CIC. The addition of television equipment has done much to eliminate the time-consuming link formerly associated with the transfer of bogey data by sound-powered telephones. But telephones are still used for action commands and to provide an audio backing for visual information. They continue to be the information link to AAW stations that do not have a critical evaluation assignment.

ANTISHIP MISSILE DEFENSE (ASMD)

The ASMD program significantly improves a ship's capability in countering high-speed, low-altitude, antiship missile threats. In attaining this defense posture, modifications are made to the overall ship's combat system to enhance low flyer and electronic warfare (EW) detection capabilities, to reduce reaction times by modifying command and control functions for weapon direction, to improve gun and missile system engagement capabilities, and to expand EW system capabilities. In addition to these combat system improvements, onboard training devices are installed to support combat information center (CIC) team training exercises. The ASMD program furthers the improvements provided by the ship's antimissile integrated defense (SAMID) immediate program by expanding the ship's capabilities to counter antiship missile threats. The ASMD program integrates additional subsystems into the combat system and makes use of expanded tactical data processing techniques in providing a fully automatic method of initiating preselected responses to particular antiship missile threats.

The ASMD program covers many more aspects of the ship's control system that are beyond the classification of this manual and will not be discussed here. For further information on ASMD, refer to NWP 31; OP 4040, Volume 1; and NWP 63-1-1.

NAVAL TACTICAL DATA SYSTEM (NTDS)

Basic to all systems are the information inputs that, in many cases, become the critical limitation on any weapons system. Although the NTDS may not be a part of the weapons officer's direct responsibilities, he or she should have some understanding of how it works. Any decision that the weapons officer makes will, in large, be based on information processed by this system, whether or not the NTDS computer is part of the installed equipment on the ship.

With the advent of the NTDS, the inter- and intraship development and control of systems and doctrine in a hostile environment may appear to have reached a point where the individual weapons officer can no longer understand and master everything needed to be known to employ the systems effectively. This, however, is not the case.

The NTDS is designed to bridge the gap between the command system and the weapon system, both on individual ships and between elements of the fleet. A salient feature of the system is that target data, obtained by any NTDS-equipped unit in a task organization, are made available almost instantaneously to all other NTDS units in the force through Link 11 and to non-NTDS ships through Link 14. Such an automatic system makes possible the optimum utilization of both offensive and defensive capabilities of ships and operational groups.

The ultimate design objective in a data system complex is to produce the following capabilities: (1) an individual ship system that automatically processes and distributes internally all data within the ship's surveillance capability; (2) a task force system that permits automatic exchange of summarized data between ships; and (3) a fleet system that permits automatic exchange of summarized data among separated forces and ship-based/shore-based command centers.

The NTDS is built around an assembly of electronic digital computers. Sensors, displays, and data link equipment make up the rest of the system that is assembled by using these basic elements as building blocks. The complexity of the total assembly is determined by the requirements of the ship's mission. For example, the CVA system must have greater capacity than the CG system to satisfy its obligation to perform air traffic control duties and extensive air intercept control.

Display consoles allow presentation of both video and real-time target information. Video presentation may be selected at will from any of the ship's surveillance radars. Other displays are provided for height and raid size. Messages that report targets contain track number, position, course, speed, and amplifying information.

Raw data are collected from many input sources aboard ship. These sources include radar, sonar, IFF, and EW equipment. Operator presentations in the NTDS machine complex consist of data input display consoles, height/size video display consoles, and data utilization display consoles. A more recently developed universal console can function as an input display or data utilization display. Data input display consoles enable operators to insert information into the computers, display raw radar information from one of several radars, and then display processed information into the computers, display raw radar information from one of several radars, and then display processed information by means of NTDS symbology and digital readout units. Height/size video consoles are used to display video from height and surveillance radars for the purpose of determining height and size of targets. Data utilization consoles are used for displaying and evaluating processed information from the computer by means of NTDS symbols, as well as for providing computer-recommended aids for decision making. Display of IFF (identification, friend or foe) is normally automatic but may also be selected by the operator.

A symbol generator receives a digital signal from the computer indicating the type of symbol to be produced. In turn, it generates digital symbol information for console PPI presentation. When used, a video processor automatically detects the presence of radar target returns and reports their positions to the computer for automatic tracking. Automatic tracking of IFF Mode II squawk is also provided on some units that have the beacon video processor.

The computers provide data storage, data dissemination, display console data processing, track processing and amplification, aids to decision making (including recommended weapon assignments), intercept control computations, and many other functions.

The ship's weapon coordinator (SWC), who may have another title (TAO), evaluates the tactical situation and executes the level of combat direction decisions for all weapons available to the ship. The SWC/TAO recommends the types of weapons to be used, designates each target to the appropriate weapon controllers in the interceptor and weapon control areas, and further, may issue hold-fire and resume-fire orders.

DATA UTILIZATION CONSOLE

A data utilization display console for displaying, evaluating, and utilizing tactical information supplied by the computer can be used in any one of the following user operating modes: air intercept controller (AIC); air traffic controller (ATC); ship's weapon coordinator (SWC); fire control system coordinator (FCSC); engagement controller (EC); force weapon coordinator (FWC); bridge; and flag. An appropriate data readout is provided with each mode of operation.

The air controller is responsible for the control of friendly and intercept aircraft as assigned. Computer-generated solutions for pursuit and collision geometries for intercept and nonintercept missions are displayed on the face of the scope. Amplifying information on the solution and the aircraft involved is displayed alphanumerically on the data readout. Orders are transmitted to the pilot by voice radio. Intercepts may be ordered and broken by the SWC/TAO or by the air controller on approval of the CIC evaluator. Semiautomated HANDOVER capability of interceptors is available to NTDS-equipped units. The CIC evaluator, with the air controller, is responsible for keeping the SWC/TAO coordinator informed of the status of the aircraft.

Air traffic controllers control all aircraft in the vicinity of a carrier that are not under an intercept controller, primary flight control, or final approach controller.

The FWC monitors and supervises overall progress of the tactical situation. The FWC initiates orders to ensure optimum use of the combined weapons of the force.

The operator in the bridge mode monitors the tactical air, surface, and subsurface situations as they affect own-ship operations, so that the commanding officer can observe the tactical picture.

THREAT EVALUATION—WEAPON ASSIGNMENT NTDS PROGRAM

The threat evaluation portion of the NTDS program is designed as an aid to the evaluator. Contact identity, position, course/speed, and survival probability are taken into consideration. A numerical value is assigned to each of these parameters. The computer calculates a threat value for every target in the sky. These threat values are readily apparent to the evaluator in operating the console. The weapons assignment portion of the program calculates how many weapons can intercept a particular target and how many targets can be intercepted by a particular weapon. Using the calculated values when a "free weapon" is available, the program, through audiovisual means, makes a recommendation to the evaluator for a weapon assignment to a particular target. If no suitable weapon is available to counter a threatening target, this situation is also brought to the attention of the evaluator by the program. NTDS also has a program for surface operation and ASW functions.

INTERSHIP DATA LINKS

Intership transmission of data is accomplished by radio communication links. Link 11 is a high-speed, automatic, two-way, HF or UHF link. This link connects NTDS ships, Link 4-A for ATDS aircraft, the beach relay facility of the

Marine tactical data system (MTDS), and corresponding Canadian and British data handling systems. Link 14, a semiautomatic HF link, furnishes a teletype broadcast of NTDS track information, which is primarily for the benefit of ships not equipped with NTDS. It provides updated track data at the rate of approximately 10 or 20 track reports per minute, depending on the teletype speed. This link operates only in the broadcast mode.

Although use of NTDS is constantly expanding, many fleet units are non-NTDS units at this time and receive only Link 14 information that is plotted on the vertical-plot board. Besides Link 14, non-NTDS units guard radio circuits to relay information or receive information that is not provided by Link 14 equipment. Circuits normally employed for these functions are the EW, ASW, and AAW command nets. The single net information position (SNIP) combines the function of the AAWR and AAWC nets into a single long-range net used to coordinate AAW actions.

The force detection coordinator controls the AAWR net. Non-NTDS units report information on hostile or unknown air, surface, and subsurface contacts on the net. They also report ECM fix information not reported on Link 14. Additionally, NTDS hold reports, NTDS track number assignments, Link 14 status reports, and non-NTDS units gridlock instructions are transmitted on the AAWR net. The number of transmissions on this net is reduced appreciably despite the supplemental type of information passed because a contact that is held on NTDS radar is reported only on the Link 14 equipment.

GUNNERY SYSTEMS

When this book was written, the major gunnery systems in use were as follows: the 5"/54 Mk 42 and Mk 45; the 5"/38 twin and single mounts; the Mk 75 (76-mm/62 caliber); and the 16"/50 caliber turret.

The fire control systems for each of these gun systems are as follows: the gun fire control system (GFCS) Mk 37, coupled with the 5"/38 caliber dual-purpose gun mount; the GFCS Mk 92 with the 76-mm gun mount; the GFCS Mk 68 and 86 with the 5"/54 dual-purpose gun mount; and the GFCS Mk 37 with the 16"/50 turret. This chapter would require a security classification if we were to list completely the technical data for all gun fire control systems. Therefore, the following discussion is in general terms only. This comment also applies to the material that is covered on missiles and ASW systems.

ANTIAIRCRAFT

The following gun systems are used for antiaircraft protection.

- 5"/38 caliber dual-purpose gun mount. The 5"/38 gun was one of the most widely used naval weapons. Now it can be found on the battleships USS *Iowa* and USS *New Jersey*. For its era, it was an effective dual-purpose gun that was used against aircraft and for surface bombardment. The 5"/38 gun mount can still be found on the following classes of ships: FF-1040 and FFG-1.

The 5"/38 mount uses separated ammunition consisting of a 54-pound projectile (weight varies somewhat with the type of projectile) and case assembly weighing about 28 pounds, which includes a 15-pound powder charge. Ballistic performance obtained with a 15-pound service charge (full charge) is as follows: initial velocity, 2,600 feet per second; maximum horizontal range, 18,000 yards; maximum vertical range, 37,300 feet. This gun is capable of sustained firing at a rate well in excess of any that can be attained by the loading crew. An experienced crew can load about 15 rounds per minute for long periods and they may attain a short-period rate of 22 rounds per minute.

- 5"/54 caliber dual-purpose gun. This is one of the most widely used guns in the fleet. We will discuss the Mk 42 Mod 9/10 and the Mk 45 Mod 0/1.

The Mk 42 Mod 9/10 5"/54 gun is installed on the following classes of ships: CG-27, DD-945, DDG-2, DDG-37, and FF-1052. It is used as a tactical weapon against surface, shore, and air targets. The mount can fire approximately 34 rounds per minute.

The 5"/54 Mk 45 gun mount is a fully automated single-barrel weapon that stows, aims, and fires 5-inch 54-caliber ammunition. It is a lightweight gun mount that provides surface escort vessels with a weapon for firing 70-pound projectiles at surface craft, low-altitude aircraft, and shore targets. It is the main gun battery for guided missile cruisers (nuclear power) (CGNs), guided missile cruisers (CGs), destroyers (DDs), guided missile destroyers (DDGs), and landing helicopter assault craft (LHA). The mount is controlled on these platforms by either the Mk 68 or Mk 86 gun fire control system.

The gun mount crew is composed of six persons, whose battle stations are below the weatherdeck. In a tactical emergency, however, a single crew member can activate the gun mount and rapidly perform the panel operating/monitoring procedures for the gun to aim and fire up to 20 rounds. In this situation, the gun mount must already be holding 20 ready-service rounds (maximum storage capacity). The gun mount handles all existing separated 5-inch 54-caliber ammunition having point detonating (PD) fuzes, proximity (VT) fuzes, mechanical time (MT) fuzes and a semiactive laser guided projectile. It can also handle 5-inch 54-caliber rocket-assisted projectiles (RAPs) and other separated ammunition if developed. The muzzle velocity is from 1,000 feet a second for reduced-charge rounds to 2,650 feet a second for service rounds.

In response to a continuous firing order, the gun mount can fire 16 to 20 rounds a minute. While the gun mount is firing, ammunition handlers hand-feed additional rounds into the gun loading system without interrupting the operating sequence.

- Mk 75 (76-mm/62 caliber) gun. The Mk 75, Mods 0 and 1, is a lightweight gun mount that is fully automatic, and remotely controlled. It is a lightweight weapon that stows, aims, and fires 76-mm/62-caliber fixed ammunition at 80 rounds per minute.

The Mk 75 gun mount is light in weight and of compact dimensions to allow installation in smaller vessels. The gun mount has a very high rate of fire and a large ready-use stowage to allow long bursts of fire without loading. It is capable of firing on short notice in an unmanned condition. Under all types of weather conditions, the mount is capable of high training, elevating speeds, and accelerations to obtain good tracking performance of high-speed targets.

To achieve light weight in the Mk 75 gun mount, extensive use is made of aluminum alloys in the carriage, cradle, and rotating magazine. Even the train bearing is aluminum alloy, but with ball bearings operating on steel wire races. Additional weight is saved by providing a one-piece pressure-molded fiberglass shield.

The Mk 75 gun mount has incorporated conventional synchros and solid-state servo control systems that will interface with the Mk 92 fire control system (FCS) to provide position orders to the mount. The primary mode of the Mk 92 FCS is AA and the secondary capabilities are the surface and shore modes.

The Mk 75 gun mount will be the main gun battery for fleet units, such as the guided missile frigate (FFG) and the guided missile patrol combatant (PGM) and patrol hydrofoil (medium) (PHM). The PGM is designed primarily for observing other naval forces in restricted sea areas and in defending amphibious operational areas. In both roles it relieves larger destroyers and escort ships. The FFG has been designed for the escort of amphibious forces, underway replenishment groups, and convoys.

- The 3"/50 rapid fire (RF) gun is semiautomatic, has an automatic power-driven loader, and is installed in open or enclosed twin or single mounts. It is primarily intended for air defense, but can be used against surface targets. The muzzle velocity is 2,700 feet per second at a horizontal range of 14,200 yards. The 3"/50's rate of fire is 45 rounds per minute per barrel.

The major limitation of AA batteries is the target acquisition problem, the range of a powder-propelled projectile, and the rate of fire. Of course, the GFCS Mk 68 and 86 with the 5"/54 guns and the GFCS Mk 92 with the 76-mm gun have many of the deficiencies of the GFCS Mk 37 and 5"/38 gun in both range and target acquisition. However, all GFCSs and guns remain essentially "close-in" weapons in today's AAW environment. Technical information pertinent to the above systems is found in the appropriate OPs and ODs.

SURFACE/SHORE BOMBARDMENT

A brief description of surface/shore bombardment of the above gunnery systems follows.

- Surface bombardment. Capabilities of the above-mentioned GFCSs and gun batteries are essentially their design and installation criteria. In other words, their capabilities to counter a surface target depend upon the maximum range of the battery, the type of projectile, the kind of target engaged, the volume of fire, the time of solution, and the exposed ship maneuvers.

The limitations of a GFCS and installed battery are the range of the engagement and the projectile flight time in slow salvo fire. If the smaller caliber batteries, the 76-mm, 3"/50, and/or 5"/38, are not on the ship's center line, they will have a limited arc of fire that will keep them from being brought to bear if the ship fails to unmask them by maneuvering.

- Shore bombardment. The capabilities of the GFCS Mk 92 and 76-mm rapid-fire gun in this area are limited to direct fire missions. Larger systems, such as the GFCS Mk 68 and 86 with the 5"/54 dual-purpose gun mount and the GFCS Mk 37 with the 5"/38 have the capability of firing all shore bombardment missions within their range. The major capability is the high degree of accuracy and tight dispersion pattern with which the systems deliver their fire. The Mk 92 FCS with the Mk 75/76mm gun can perform exceptionally well in gun fire support, however, the four elements it cannot do are illumination, beacon, reduced charge, and fuze time engagements.

The major limitation with all the systems having the full shore bombardment capability is the method of delivering reverse slope fire (defilade fire). This is because of the flat trajectory of the naval guns. A different method of computing gun orders is required, and it results in very high elevation orders, thus cutting the range of the mission considerably as well as resulting in less accuracy.

The only gun system we have not discussed in any detail is the 16"/50 caliber turret. It was purposely omitted to be discussed later under shore bombardment, even though it can be used against surface targets. As we discussed earlier, there are three commissioned ships that have the 16"/50 caliber guns. They are USS *Iowa* (BB-61), USS *New Jersey* (BB-62), and USS *Missouri* (BB-63). Each ship has main gunnery system batteries containing three 16-inch 3-gun turrets.

The main battery of each ship has nine 16-inch 50-caliber turret-mounted guns that are chambered for bagged powder charges, and they are equipped with an interrupted-screw-type breech mechanism. The guns, which may be fired at the rate of two rounds per minute, have a maximum range of approximately 41,000 yards.

The main battery design provides for accurate firing of either armor-piercing or high-capacity projectiles at targets, which include surface ships and shore installations. Armor-piercing projectiles are capable of penetrating up to 16 inches of armor plate. High-capacity projectiles, which are used against ships and shore installations, are fuze-set to detonate on contact or at a predetermined time.

MISSILE CAPABILITIES AND LIMITATIONS

The Standard missile, the BT-3 Terrier, the Harpoon missile, the Tomahawk missile, and the point defense surface missile system (Sparrow III RIM-7 missile) are discussed here. These missiles were also discussed in chapter 6 and, as in chapter 6, we are limited to our discussion because of the classification of these weapons.

ANTIAIR

The Standard missile was designed to replace both the Tartar and Terrier missiles. It has two range capabilities depending on the missile configuration. The main capability may be considered the larger range of engagement in comparison to gun ranges. Technical data for the individual systems and missiles are available from the appropriate OP or OD.

As mentioned above, the main capability is in the increase of range available to engage incoming raids. All are controllable in flight, which makes it possible to compensate for solution errors in the fire control system and to compensate for target maneuvers. Only the Terrier has nuclear capabilities.

A major limitation of guided missiles is reaction time for those that require warm-up before being launched. Another limitation is the rather long minimum effective range.

In view of the limited minimum range of larger missiles, other short range defensive missile systems such as the basic point defense surface missile system (BPDSMS) was developed. It was developed specifically to cope with low-flying attack aircraft and missiles.

The system is a simple, low-cost, small-size, shipboard surface missile system for use against air targets, but it has some surface capability. It performs the functions of target acquisition, target tracking, missile firing, and missile guidance.

The Sparrow III (RIM-7) missile is used in the system. One of its distinguishing features is its minimum intercept range.

SURFACE/SHORE

The Standard, Terrier, Sparrow III, Tomahawk, and Harpoon systems have surface capability. Their flight patterns are controllable, but the accuracy of control decreases as the range of the mission increases with a resultant decrease in terminal accuracy. The employment of these weapons in these modes is determined by the threat and value of the target in relation to the cost of the missile. The Harpoon system is designed to be used against surface targets only. The Tomahawk is designed to be used against both surface and shore targets, and can carry nuclear warheads.

ASW WEAPONS/SYSTEMS

Currently, there is a small inventory of ASW weapons and weapons systems in use in the fleet. Among these are the ASROC (both torpedo and nuclear depth charges) and the tube-launched torpedoes. The capabilities and limitations of associated sonars, to a large extent, determine the effectiveness of these weapons. In other words, our ability to detect and evaluate possible submarine targets limits the employment of these weapons. With the modern submarines operating at greater depths and traveling at increased speeds, the modern weapons and sonar systems are constantly being modified to counter these advances.

ANTISUBMARINE ROCKET (ASROC)

The ASROC missile is one of the Navy's primary surface launched antisubmarine warfare (ASW) weapons. It is mainly handled by the Mk 16 ASROC launching groups, and it is adaptable to the Mk 10 Mods 7 and 8 and Mk 26 guided missile launching systems (GMLSs). Ships with these GMLSs installed do not have a Mk 16 ASROC launching group.

The ASROC missile is available in two basic configurations—a rocket thrown torpedo (RTT) utilizing the Mk 46 torpedo and a rocket-thrown depth charge (RTDC).

The advantage of ASROC over a tube-launched weapon is in the increased standoff range it affords the firing vessel.

LIGHT AIRBORNE MULTIPURPOSE SYSTEM (LAMPS)

The LAMPS has extended the standoff range for the firing vessel. Not only can it deliver a torpedo to the target at an advance range, but it can also search, detect, and attack a target with its own sensor system.

The helicopters used aboard ships include the SH-2G *Seasprite* and the SH-60B *Seahawk*.

The payload carried by these helicopters is the Mk 46 torpedo, the same weapon used in the ASROC and also fired from the surface vessel's torpedo tubes (SVTTs). The torpedo is equipped with launch accessories (parachute, bands, and so forth) to adapt to the air launch mode.

SURFACE VESSEL TORPEDO TUBES (SVTTs)

As discussed earlier, the Mk 46 torpedo is also launched from the SVTTs. The SVTTs used in the fleet are the Mk 32 (Mods 5, 7, 9, and 14). The torpedo tubes are used for stowing as well as launching the torpedo. These tubes can be fired either remotely or locally; however, manual firing is intended only as an emergency measure.

To launch the torpedo from the weather decks of surface vessels, the Mk 32 Mods 5 and 7 are used. The Mods 9 and 14 are located inside the ship's superstructure, where the magazine and torpedo room are together.

SONAR

The sonar systems AN/SQS 23, 26, 53, and 56 are in use in the fleet today. The fire control systems that are used with these systems are as follows:

- AN/SQS 23 and 26 are used with the Mk 111 and Mk 114 fire control systems.
- AN/SQS 53 and 56 are used with the Mk 116 fire control system.

The active acoustic range of today's sonar is in excess of 50,000 yards. These long ranges, coupled with the installed sophisticated fire control systems, has greatly enhanced our ASW capabilities.

Because of the security classification of the sonar system, we cannot go into further details. For more information, refer to the appropriate ODs and OPs on the various systems.

ELECTRONIC WARFARE SUPERVISOR (EWS)

We have discussed various weapons systems and some of their applications; but in today's warfare, another factor has come up. The use of electronic warfare (EW) has entered into our AAW picture and has to be dealt with. The electronic warfare supervisor is responsible for entry of gathered information concerning EW into NTDS for external use and transmission over Link 11. Many of the EWS's duties are classified and cannot be adequately dealt with in this book; NWP 63-1-1 gives a good job description of the EWS.

This chapter is brief and has only lightly touched on NTDS and the ASW/gun/missile systems. Training in combat systems is a never-ending process and has to be approached aggressively and continuously until the person acts almost automatically on the job.

The duties of the weapons officers are many and complex and will require total dedication to gain and have effectiveness.

REFERENCE LIST

Antiair Warfare, NWP 32, Office of the Chief of Naval Operations, Washington, D.C., October 1983.

Gunner's Mate G 3 & 2, NAVEDTRA 10185-C, Naval Education and Training Command, Pensacola, Fla., January 1981.

Gunner's Mate M 3 & 2, Vols. 1 and 2, NAVEDTRA 10188 and 10189, Naval Education and Training Command, Pensacola, Fla., January 1983.

NTDS Operations In AAW/ASMD, NWP 63-1-1, Office of the Chief of Naval Operations, Washington, D.C., July 1982.

Operations Specialist 3 & 2, Vols. 1 and 2, NAVEDTRA 10145 and 10146, Naval Education and Training Command, Pensacola, Fla., January 1983.

Torpedoman's Mate 3 & 2, NAVEDTRA 10163-D, Naval Education and Training Command, Pensacola, Fla., January 1982.

Sixteen-Inch Three-Gun Turrets BB 61 Class, Naval OP 769, Naval Sea Systems Command, Washington, D.C., August 1982.

CHAPTER 9

WEAPON EXERCISES

The intent of this chapter is to give you an overview of those exercises that may be encountered, not to give you all the details on various exercises that may be required for your department. Because weapon exercises are innumerable, covering them all in detail is beyond the scope of this text. Also, the classification of publications in which the exercises are found preclude giving detailed information of these exercises in this text. Detailed information on these exercises can be found in *Submarine and Antisubmarine Exercises*, FXP 1; *Air and AAW Exercises*, FXP 2; *Ship Exercises*, FXP 3; *Preparation, Conduct, and Analysis of a Battle Problem*, FXP 3-2; and your type commander's master training plan.

FLEET EXERCISE PUBLICATIONS (FXPs)

The Navy has four FXPs. These publications will only be explained briefly. Three of the FXPs are Confidential publications and cannot be discussed in depth.

- FXP 1: This publication establishes tactics and procedures for conducting submarine and antisubmarine exercises along with the criteria for evaluating the results.

Each exercise discussed in the FXP is identified by a letter-number-letter designator. The prefix denotes the type for which the exercise is primarily designed; for example, A—aircraft, S—submarine, and so forth.

Signified by the suffix is the type of training the exercise is designed to give; for example, T—torpedo, S—seamanship, and so forth. The exercise *S-1-T* would denote *submarine exercise one* (1) using a torpedo.

To permit a valid evaluation of unit readiness, the weapons officer must keep the number of controlled exercises umpired and reported to the minimum required.

- FXP 2: This publication contains the training exercises prescribed for air- and AAW-oriented ship's personnel. As in FXP 1, each exercise is identified by a letter-number-letter designator. The following exercises are covered in FXP 2: basic air; air-to-air; air-to-ground; electronic warfare; photographic/reconnaissance; antiaircraft gunnery; surface-to-air missile; CIC; AEW; and minesweeping.

- FXP 3: This FXP is about ship exercises and encompasses in one publication all of the training exercises, exclusive of AAW and ASW, prescribed for the crew members of surface ships of all types. Since the surface ship is the basic unit in naval warfare and the reference point for most air and submarine activities, FXP 3 is considered to be the basic publication in the FXP series. As in FXPs 1 and 2, each exercise is identified by a letter-number-letter designator.

The ship excercises covered in FXP 3 include the following exercises: gunnery, engineering, damage control, navigation/seamanship, communications, electronic/casualty control, amphibious force, mine force, air department, intelligence, explosive ordnance disposal, antiship capable missile/multi-threat, and over the horizon targeting exercises.

Also covered in FXP 3 is guidance to exercise planning and evaluation.

- FXP 3-2: FXP 3-2 (unclassified) provides guidance for planning and conducting the umpire/observer operation in larger competitive exercises.

From these publications, type commanders select certain exercises to be used for competitive purposes by their commands. The exercise selection depends on the characteristics and missions of the type of ships. Selected exercises are outlined in the type commander's master training plan and form the basis for awarding battle efficiency *E*s throughout the command. The type commanders must also inform COMTRALANT/PAC as to the standard training requirements for ships in shakedown/refresher training. Before firing a competitive exercise, you must understand completely what the type commander requires. In most cases, the type commander agrees with the exercise procedures that are outlined in FXPs; but the standards for exercise grading may be significantly different.

Keep in mind that the primary goal of these exercises is not just to get a battle efficiency *E*, but to develop the ship into an efficient and effective fighting unit. Performance, endurance, and preparedness are the principal criteria for determining whether a ship is combat ready in a specific mission area.

NAVAL WARFARE PUBLICATIONS (NWPs)

We are only going to discuss the appropriate NWPs that will aid the command in conducting naval exercises.

The mission areas for combatant type commands are antisubmarine warfare, antiair warfare, surface warfare and gunfire support, and cold war performance and readiness. Mission areas for each ship type are spelled out in NWP 11-1, *Characteristics and Capabilities of U.S. Navy Ships*, with required operational capabilities (ROC) specified for each type warfare. A ship is not considered to be at a level in any of these mission areas that is higher than the level it is able to demonstrate in mobility. Mobility is defined as engineering, damage control, and logistics readiness.

Several levels of readiness can be claimed by a ship in a specific mission area. They are basic, primary, intermediate, advanced, and expert. They range from the successful completion of refresher training to the ability to demonstrate advanced readiness under conditions of surprise, darkness, umpired damage, and casualties. Various definitions of readiness can be found in NWP 3, *Naval Terminology*.

Each level of readiness in each mission area is typified by the approved type commander's standard exercises and tests. A ship, at a given level of readiness in any mission area, is expected to perform the applicable tests and exercises on short notice and should demonstrate highly creditable proficiency. The successful completion of an exercise that is listed on a higher level than that claimed by a ship does not automatically advance the ship to that level. On the contrary, a ship's commanding officer must lay claim to a readiness level and then be tested periodically by the squadron, flotilla, or type commander to see if the level is warranted.

Under present rules, the levels of combat readiness are considered in awarding the battle efficiency *E* and in making awards for operational excellence. In addition, division, squadron, and flotilla commanders use the combat readiness evaluation standards to assist them in their day-to-day evaluations of individual ships.

Just a word or two on the battle efficiency *E*. The required competitive exercises include exercises for weapons, ASW, engineering, damage control, and operations. Type commands may follow different procedures; these are described in the combat training and exercise manual for that type command.

TYPE COMMANDERS' MASTER TRAINING PLAN (MTP)

Type commanders issue an MTP for their naval commands. In recent years, both COMNAVSURFLANT and COMNAVSURFPAC have aligned their MTPs to have their training standardized.

In the MTP, both policy and guidance are provided in conducting training by each respective unit. The primary objective of the MTP is to promote for the attainment and maintenance of the highest state of combat readiness for our naval forces.

All areas of exercises are covered by the MTP and, in addition, it provides guidance for awards, competition, and scoring of exercises; for example, the Antisubmarine Warfare Excellence Award, the Antiair Warfare Excellence Award, and so forth.

EXERCISE OBSERVERS

The officer scheduling the exercise (OSE), who also may be the officer conducting the exercise (OCE), arranges for the appointment of a chief umpire of appropriate seniority and experience. The chief umpire may be the executive officer, the department head, or the division officer of the ship. When the importance of the exercise warrants, the OSE may arrange for the appointment of umpires. Under most conditions, these exercises may be observed by own ship's personnel.

All members of the observing party have responsibilities as safety observers. Regardless of other duties, umpires must take immediate action to notify responsible ship's personnel if a dangerous situation appears to be developing. Umpires thus aid in preventing serious casualties. Even so, in training exercises as well as in actual wartime situations, the primary responsibility for safety must be with the operating personnel.

The assignment of umpires as additional safety observers should be limited to minimize interference with the conduct of the exercise. The chief umpire details, organizes, trains, and stations the observing party. The members of the observing party must be able to instantly note and record unsatisfactory variations of or conditions in the

1. procedures and doctrine used,
2. general state of training,
3. efficiency and safety in handling casualties, and
4. overall performance.

The chief umpire will personally

1. check the principal scoring factors;
2. make the more important umpiring decisions;
3. sign the exercise reports prepared for the type commander; and
4. require the party to detect and to report back any departures from instructions governing the exercise and from other authority, such as the FXP publications and the type commanders' MTPs.

The assistant chief umpire assists the chief umpire, as directed, and supervises the other members (umpires) of the observing party who collect specified data for exercise grading and reporting.

In evaluating the exercise, the chief umpire should rely on the type commanders' standards. Umpires, stationed at vantage points that depend on the exercise and the equipment installation, observe the performance of the participants before and during the exercise. They grade the exercise according to scoring criteria provided with the detailed procedures for conducting each exercise. Analysis of all data should disclose sources of error as well as factors contributing to good performance. Upon completion of the exercise, a critique should be held as soon as possible, and should include as many of those personnel available who participated. This procedure will help determine the

1. manner of performance,
2. errors committed,
3. inadequate procedures or lack of required procedures, and
4. recommendations for the improvement of material and personnel performance.

Observers must familiarize themselves with the operational characteristics of the systems that are going to be exercised. The doctrine for target acquisition procedures does not vary, but operational aspects do. Errors committed in a Mk 37 fire control system are functionally different from those made with a weapons direction system.

PLANNING

Planning for an exercise is perhaps the most important requirement for success. The purpose is to integrate the ship's operating schedule, equipment maintenance program, and training through the executive officer's planning board for training. Proper planning should allow an optimum use of personnel, money, and materials and also open communication to ship's personnel on what is going on and why. This subject was covered in an earlier chapter. An outstanding mark in any weapons exercise requires a maximum amount of preparation. To prepare, you should do the following:

1. Read *all* of the references that pertain to a particular exercise.
2. Assist the operations officer in arranging for target services and observers.
3. Prepare a complete firing plan.
4. Conduct a prefiring briefing and iron out each minute detail.
5. Supervise the completion of prefiring check-off lists.
6. Drill.

Drills are an essential part of the planning procedure. We have broken drills down into two categories: drills for station personnel and drills for control personnel. A drill should show each crew member what to do, when to do it, and how to do it. After many drills, a person should develop a reflex action in performing battle duties.

The mind is then clear to detect and properly react in emergencies. A good drill is exacting; it uses everyone in the team. You should plan these drills in advance. Make them interesting, keep them short, and adhere to prescribed schedules.

Drills, if properly conducted, result in good discipline. Discipline is just as important in controlling a battery as it is on the bridge when the ship is in hazardous waters. You must train your personnel to react instantly and exactly to all commands. Your weapons station personnel must know the sequence of the exercise, standard commands, casualty procedures, and system safety precautions. All personnel in control situations must know the doctrine.

Before any weapons exercise is fired, a firing plan must be drafted, approved by the commanding officer, and given to key personnel. More than likely, you can find an established firing plan format in your weapon's department or ship's notice files. The firing plan covers the exercise factors that are found in FXP 1, 2, 3, and the MTP, insofar as they affect the procedures for firing.

Weapons officers draft firing plans, including amplifying information that applies to their own ships; for example, which gun or guns are to fire on any run, or the type of ammunition and the number of rounds per gun per run. Also named is the controlling director, and any special provisions that may alter the situation, procedure, and so forth.

After distributing a firing plan, conduct a prefiring briefing. Each item in this plan should be discussed, with particular emphasis on control procedures. The briefing should be attended by all weapons department officers and key enlisted personnel. By key enlisted personnel, we mean all control personnel including the mount captains, pointers, trainers, and sightsetters. All persons who have been named as safety observers should also attend. Perhaps your briefing space is large enough to include all other persons who have weapons general quarters stations.

The following is a note of warning. Going into this briefing with half-formed ideas on how to conduct the exercise is a serious mistake. If you open the door for debate on procedural issues, you will most likely confuse some of the personnel. Talk out procedure issues with your officers beforehand to ensure that they do not ask moot questions during the briefing and that they understand the correct procedures. At the briefing, your procedural policies must be "rock-ribbed" and unswerving, unless, of course, you find that you have made obvious errors.

Get the personnel interested by explaining the tactical situation that the exercise presupposes. Show them the hypothetical data that you have used to evaluate the scoring formulas. They already know the need for accuracy. Show them how time affects the score. Time is particularly important in surface exercises and gunfire support.

The type commanders have prepared certain instructions that provide a comprehensive look at prefiring checks. For example, "Gunnery Notes," COMSURFLANT/COMSURFPAC Instruction, 08000, prescribes what is to be done starting 3 days before the firing day.

Malfunctions in fire control equipment and discrepancies in battery alignment must be detected, noted, and corrected prior to the firing day. Fire Control Technicians should "peak up" all radars, particularly the automatic tracking circuits. They should also adjust the "range zero set" following PMS procedures and applicable equipment documentation. Numerous items must be checked prior to a firing exercise. Mentioning them for gun systems, missile systems, and ASW systems would take more space than we can spare in this text. The point to be aware of is that these checks must be paramount in your planning. All necessary prefiring checks have been included as part of your ship's PMS.

GUNNERY EXERCISES

Standard surface gunnery exercises are described in FXP 3, chapter 2; they may be modified by the type commander's MTP. These exercises are designed to train combatant ship personnel in the delivery of accurate fire on surface targets and shore targets. FXP 2, chapter 7, covers antiaircraft requirements.

The basic surface gun fire exercise is the Z-21-G, an elementary, short-range exercise for 3-inch guns and larger. This is used to show the format of the FXP presentation of exercise requirements.

Under the exercise title is the stated purpose; for example, training in elementary, short-range exercise fire by turrets, mounts, or single guns individually, using local aiming at a sled target towed at intermediate speed.

The next section deals with requirements, such as a ship and tow target sled, and a camera party to photograph the fall of the shot. Ammunition requirements for the exercise are specified for the particular caliber of gun to be fired.

Any special provisions to be followed in a particular exercise are then presented. In this exercise, these include range band provisions for various caliber guns; provision for determining time of commencement of fire; and safety precautions. The next section deals with procedures that the OCE, tow ship, and firing ship will follow.

The final section provides for evaluation. This section lists the reports required and gives the scoring formula. The Z-21-G exercise contains an evaluation condition section just before the evaluation section, but this is unusual. Penalty provisions are included in the evaluation section of some exercises.

One of the most important surface exercises you will fire is the Z-24-G, calibration of main or dual-purpose batteries. This exercise is fired to find your battery's ACTH (arbitrary correction to hit) as well as pattern size and shift of your MIP (mean point of impact). This exercise is mandatory; it shows the result of your battery alignment.

Other exercises in surface gunnery are the Z-23-G (delivery of long-range surface fire under simulated night conditions without illumination); Z-25-G (day spotting of surface fire and optical spotting at night using illuminating projectiles); Z-27-G (short-range surface fire in local control, ranging, and spotting for mount and turret crews); Z-28-G (offset spotting for elementary training in delivery of surface gunfire for ships in company when no towed target is available; this is an exercise similar to a Z-21-G); Z-29-G (training for machine-gun personnel in sinking, drifting mines); and a Z-30-G (to train 5-inch, 3-inch rapid fire, and smaller automatic weapons personnel in procedures to counter small, high-speed surface craft day or night).

To determine limiting safe bearings and safe fire areas, all surface exercises require a relative plot to be maintained. (See FXP 3, figure 2-2.).

Gunnery exercises for evaluation of the ship's personnel in shore bombardment are also given in FXP 3. Reports of these exercises are normally prepared by the shore fire control party (SFCP). The ship follows the approriate NAVSEA instruction to prepare and submit the applicable gunnery and ammunition sheets. Procedures and doctrine should be based on type doctrine, *Supporting Arms in Amphibious Operations and Supplement*, NWP 22-2; (latest revision); *Battle Control*, NWP 50-1; and *Allied Spotting Procedure for Naval Gunfire Support*, ATP 4 (latest revision). Amphibious commanders in both the Pacific and Atlantic fleets also have instructions that provide for refresher courses for ship's shore bombardment teams in naval gunfire support.

Because of the importance of procedure, timing, and accuracy required in a naval gunfire support mission, ship's exercises in this area, basically eight in number, provide stiff penalties for errors.

FXP 3 provides three penalty tables, one each for time, procedure, and communication errors. These penalties will be assessed in conjunction with the scoring of any exercise.

The intent of this chapter is not to cover procedures and requirements for each exercise, but to briefly mention the purposes of some of the exercises.

The purpose of Z-40-G, counterbattery and destructive fire—ship spot, is to train ship's personnel in the delivery of direct destructive fire on a point target. Indirect call fire—SFCP, or air spot, is conducted to train ship's personnel in the delivery of indirect call fire on a point target with either a shore fire control party or air spot.

Indirect illumination and destructive fire, Z-44-G, is used for the purpose of training ship's personnel in the delivery of indirect illumination fire to illuminate a point target for indirect destructive fire. Z-45-G is a prearranged, indirect destructive fire. The Z-46-G is a D-Day fire exercise that trains ship's personnel in delivery of fire against prearranged area and point target fire, counterbattery, and indirect call fire.

The combined shore bombardment/counterbattery/surface/AAW exercise is designed to train ship's personnel in optical ranging, spotting, and delivery of direct destructive and counterbattery fire while maneuvering at high speed and while coping with an air and/or surface threat.

Space limitations in this text preclude listing all the gunnery exercises that are prescribed for crews of surface ships. Additional information on the procedures and requirements for all gunnery exercises, excluding AAW and ASW, may be found in FXP 3, *Ship Exercise*.

Antiair warfare exercises for gunnery are found in *Air and AAW Exercises*, FXP 2, chapter 7. This chapter contains basic and advanced firing exercises and tracking drills. The presentation of FXP 2 is similar in most instances to FXP 3.

The AAW firing exercises for guns range in difficulty from basic to advanced. Two of the nonfiring exercises involve tracking, designation, and acquisition. The appendix in FXP 2 prescribes the general procedures for obtaining required air services for the exercises. Air services may be modified depending on where you are and who is providing services.

Just as in surface exercise fire, AA firing exercises have safety bearings with the addition of minimum safe position angles for tow or control aircraft. A table of minimums versus gun caliber is found in the introduction to chapter 7.

Drone or high performance target pilotless aircraft, Z-8-AA, is designed to train ship's personnel in the delivery of AA gunnery fire toward a high-speed, maneuvering target. The target runs simulate all runs that could be made by actual manned aircraft. The target used in this exercise is a heavy drone, or, essentially, a large pilotless aircraft.

The Z-9-AA small pilotless aircraft provides training in the delivery of AA gunnery fire on one or more small, high-speed maneuvering targets. This exercise is simply a Z-8-AA exercise compounded.

The Z-10-AA, AA high-speed basic, and Z-11-AA, AA high-speed advanced, differ only in the runs made by the aircraft. Both exercises train personnel in acquiring a target by radar and firing at high-speed targets. The Z-11-AA imposes the additional handicap of firing at a very high bearing rate. The Z-10-AA (basic) exercise is a prerequisite to firing the Z-11-AA.

The nonfiring exercises for gunnery personnel are the Z-15-AA aircraft control, multiple attacks, nonfiring, and the Z-17-AA, AA target designation and acquisition, nonfiring. The latter is used to train personnel in the designation of air targets and fire control systems. The major element in this exercise is time. The Z-15-AA exercise trains ship's personnel in repelling air attacks using combat air patrol (CAP) or other available aircraft and installed armament. Both exercises require intensive coordination between CIC, weapon control, and director personnel.

MISSILE EXERCISES

Guided missile exercises have three basic purposes: (1) to determine operational capability; (2) to maintain weapon system performance and tactical readiness of equipment and personnel at the highest possible level; and (3) to test technical and procedural modifications to the missile system. Such exercises may require missile firings or the missile firing may be simulated.

When missile firings are conducted to determine operational capabilities or to maintain a high level of system performance, the target should simulate a realistic threat. Constraints imposed by economic considerations, safety, instrumentation for data, and limitations of drone capabilities frequently prohibit exact duplication of realistic threats for missile firings. Missile firings to test system modifications are conducted by ship's personnel, following the test program.

FXP 2 and 3 specify exercise events. The type commander generally issues specific instructions in a battle readiness publication that delineates or modifies the FXP exercises. The exercise planner must consult both FXP and the type commander's instructions for the type of exercise and scoring method required for competitive events. Exercises should always be analyzed not just for scoring purposes but also to determine the remedial action needed. Safety zones prescribed for these exercises are found in FXP 2, Chapter 8. The surface-to-surface problem is basically a simple ballistics problem. You should remember that these exercises may be basically modified by competent authority, particularly in the scoring aspects.

A clear safety zone must be selected before missile firing. Aside from transient ships and aircraft, missiles are potentially hazardous to supporting ships and aircraft as a result of booster impact, fragmentation fallout, and guidance or homing errors. Prior to expenditure by naval commands of ordnance/missiles through an overcast in an approved warning area, special procedures to ensure range clearance must be established. The operational commander conducting the exercise is responsible for a clear range prior to beginning an exercise. Procedures to ensure a clear range may be established based on visual/radar surveillance. In the final decision by the OTC and the OCE, all applicable factors are considered. The safety zone should be surveyed using all available facilities, including ship's radars and lookouts as well as aircraft when available.

ANTISUBMARINE (ASW) EXERCISES

Antisubmarine exercises provide training in all phases of ASW, including procedures for tracking and plotting a target ship, operation of sonar equipment, evaluation of bottom contacts, the use of ASW weapons, and other exercises involving antisubmarine warfare. Each exercise is designed to train personnel in a specific phase of ASW.

Surface ship exercises are presented in chapter 8 of FXP 1, "Submarine and Antisubmarine Exercises." The first two chapters of FXP 1 list the responsibilities for conducting the exercises.

Chapter 1 outlines the conduct of exercises, while chapter 2 prescribes the safety precautions that each participating unit must strictly follow.

Numerous standard ASW exercises involve one or more ships for each exercise. Some of these apply to certain ships, depending upon installed armament. These exercises are found in chapter 8, "Surface Ship ASW Exercises." Chapter 9, "Coordinated Exercises," also involves weapons department participation aboard a destroyer but is oriented toward CIC intraship, submarine, and aircraft phases. These exercises are presented in the same manner as in the other fleet exercise publications discussed previously. Special instructions generally applicable to all exercises are presented in chapters 1 and 2 of FXP 1 with additional instructions in each exercise description. Usually chapter 8 of the type commander's MTP provides guidance and standards for ASW training.

BASIC EXERCISES

The basic exercises deal with the operations of the weapons system against a few targets. Although some training is provided in connection with CIC, Conn, and WCS functions, you must have a basic knowledge of operations in these areas. These exercises allow the individual ship to explore the capabilities and limitations of its missile system when using missiles alone and when using missiles in coordination with the Combat Air Patrol (CAP).

Z-1-GM through Z-7-GM exercises also provide the means for the orderly processing of the target data from the initial detection to the simulated kill. If any deficiencies are to be uncovered, the system should be operated strictly following the individual ship's doctrine.

Exercises Z-10-GM through Z-23-GM are tactical AAW exercises. The purpose of the exercises is to train system personnel in coordinated operations of the systems in response to medium size multiple targets and low acquisition times. Evaluation of these exercises follows FXP 2 and the applicable type commanders' instructions.

Sufficient data must be recorded from each exercise to permit a complete time-range reconstruction of the entire exercise. This should include all aircraft, regardless of whether or not they are engaged, and all engagements, including those against false or nonexercise targets. Scoring of combat air patrol (CAP) intercepts, if applicable, follows type commander's instructions or other competent authority.

The Z-13-GM exercise has been established as a performance standard that can be used to gauge improvement or deterioration of the system's performance in other environments or casualty modes. Proper recording of all data from this exercise will show the location of all reaction times, such as weapons data systems decision time, fire control acquisition, and kill assessment.

The following exercises are surface-to-air firing exercises: The Z-30-GM—missile firing basic for training ships to deliver accurate surface-to-air missiles against high-altitude targets under circumstances well within the limits of the missile system, yet permit a complete check of the system operation and the effective gathering of data; the Z-31-GM missile firing high bearing rate (purpose is self-explanatory from title); the Z-32-GM extreme range firing, one director (self-explanatory); the Z-33-GM two missile firing, two directors (to train ship's personnel to fire missiles accurately against high altitude targets at maximum effective range of missile); Z-34-GM missile firing salvo (to train personnel to fire missiles accurately against high altitude targets under simulated wartime conditions).

The Z-35-GM, missile firing surprise, is designed to train personnel to accurately counter-surprise targets at or near minimum effective range. The Z-36-GM missile firing, low angle, is designed to train personnel to counter low altitude targets at or near minimum effective range. The Z-37-GM is a multiple target exercise. The Z-39-GM missile firing/low TAU attack trains personnel to fire missiles accurately against targets coincident with a low TAU (high density) attack. TAU is defined as the time interval between arrival of successive aircraft at maximum missile range, regardless of bearing. The shorter the time interval between arrivals, the faster the system will be saturated with targets.

The procedures and requirements for missile firing exercises may be found in FXP 2, FXP 3, and the type commanders' instructions.

SEAMANSHIP EXERCISES

These exercises include ship-handling emergency drills and procedures, and replenishment at sea. Those mentioned are the ones that will involve the weapons department. Reports for these exercises shall be as directed by the type commander.

The contents of the exercises presented below are self-evident from their titles. The list is particularly applicable to combatant ships

However, for amphibious-type ships and minesweepers, these exercises, in addition to others in FXP 3, may be required. As in any exercise, preparation, procedures, and safety precautions are graded.

- SHIP HANDLING

Z-3-S	Anchoring or mooring
Z-4-S	Mooring alongside a pier or ship at anchor
Z-5-S	Getting underway with the duty section
Z-6-S	Towing and being towed

- EMERGENCY DRILLS AND PROCEDURES

Z-11-S	Man overboard
Z-14-S	Preparations for abandon ship
Z-16-S	Visit and search
Z-16-S	Boarding, capture, and supplying a prize crew

- REPLENISHMENT AT SEA

Z-20-S	Helicopter launching and recovery
Z-21-S	Vertical replenishment
Z-26-S	Underway transfer and emergency breakaway
Z-28-S	Underway provisioning, rearming, and emergency breakaway
Z-29-S	Underway fueling from oiler or between combatant ships, and emergency breakaway
Z-30-S	Underway fueling by and from oiler, and emergency breakaway

SAFETY PRECAUTIONS

Safety precautions are listed in each FXP, in the type commander's MTP, and in the current NATOPS manuals.

Safety precautions are listed in FXP 1 in chapter 2 as well as throughout the text. These safety precautions cover everything from safety watches to exercise weapon attack precautions.

FXP 2 and 3 also list safety precautions that are mandatory throughout the texts. All exercise participants must adhere to applicable safety precautions as set forth in current NATOPS or tactical manuals as well as local instructions. The OCE is responsible for briefing personnel on all safety procedures. *Skip It* and *Knock It Off* calls may be initiated by any exercise participant who observes an unsafe condition. Regardless of source, aircrews will execute and acknowledge all *Skip It* and *Knock It Off* calls immediately.

REPORTS

Exercise reports for each exercise described are enumerated in individual exercises in FXP 1, 2, and 3. The firing ship is responsible for report analysis and preparation. The type commander designates the exercises to be conducted by the ships for which written reports are required.

SUMMARY

The duties and responsibilities of the weapons officer are given in chapter 1 of this book. Chapters 2 through 9 deal with a few of the areas that concern the weapons officer.

The bibliography at the end of each chapter is there to assist you in furthering your understanding of the subject material. With our modern ships and weapons currently in use and those being built or being planned for the future, the role of the weapons officer will become more demanding; but we should never forget that manpower and individual human skills are the paramount keys to readiness.

REFERENCE LIST

Air and AAW Exercises, FXP 2, Office of the Chief of Naval Operations, Washington, D.C., October 1981.

Preparation, Conduct, and Analysis of a Battle Problem, FXP 3-2, Office of the Chief of Naval Operations, Washington, D.C., September 1976.

Ship Exercises, FXP 3, Office of the Chief of Naval Operations, Washington, D.C., March 1981.

Submarine and Antisubmarine Exercises, FXP 1, Office of the Chief of Naval Operations, Washington, D.C., September 1976.

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